1 7 U 1 1

INSTRUCTIONS TO BIDDERS

FORM OF PROPOSAL

To receive consideration, the Proposal in triplicate must be submitted on the form herewith provided, with all items of the form properly and completely filled out in ink or typewritten. Proposal amounts shall be stated both in writing and in figures. In case of a discrepancy between the written statement and the figures, the written statement shall govern. Erasures or other changes in the bid shall bear the signature of the bidder. Proposals shall not contain any added conditions qualifying statements or recapitulation of work to be done.

Sealed proposals, in duplicate, should be delivered to the office of Mr. James C. Farrand, Manager of Research and Development, Plainwell Paper Company, Plainwell, Michigan 49080, before the time indicated in the Invitation for Bids. The bidder shall retain the third "Proposal Form" as his file copy.

Proposals shall be enclosed in sealed opaque envelopes marked on the outside as follows:

> "Water Pollution Abatement - Phase IIA Work -
> Proposal for Plainwell Paper Company,
> Plainwell, Michigan".

with the name of the firm which is bidding.

Telephonic or telegraphic proposals will not be accepted. On a bid which has already been filed, telegraphic modification of the proposal sum received prior to the bid opening time will be accepted. No modifications by telephone will be accepted.

WITHDRAWAL OF BIDS

Any bidder may withdraw his bid at any time prior to the hour and date specified for the opening of the bids, provided that a written request by the bidder is received not later than the scheduled time for opening of the bids.

QUALIFICATIONS OF BIDDERS

Upon request, any bidder to whom award of the work is contemplated shall submit:

- A list of similar work done by the bidder, with purchaser references
- A financial statement
- A statement as to the organization, physical plant and equipment available for doing work

EXPLANATION TO BIDDERS

Neither the Engineer nor the Owner will give verbal answers or any inquiries regarding the meaning of the bid documents, or verbal instructions, previous to the award of the Contract. Any verbal statement regarding the bid documents by any person previous to the award shall be unauthoritative.

The Contractor shall not take advantage of any apparent error or omission in the bid documents, but the Engineer shall be permitted to make such corrections and interpretations as may be deemed necessary for the fulfillment of the intent of the Plans and Specifications.

Any explanation desired by bidders must be requested of the Engineer in writing and, if explanation is necessary, reply will be made in the form of an addendum, a copy of which will be forwarded to each bidder whose work is affected. Such request shall be made seven or more days before the bid opening date.

Any addendum issued prior to date of opening of proposals shall become a part of the bid documents, and all proposals shall include the work described therein. Each bidder shall acknowledge receipt of each addendum in his proposal.

AWARD DATE

The date of the contract award shall be the date of which the Plainwell Paper Company approves the award.

CONDITIONS OF WORK AND SITE

The bidder represents that he has visited the site and informed himself as to all conditions, including other work being performed; and he agrees to furnish any materials or to perform any work and render any service that may be required to complete the work included in the Contract, in accordance with the ture intent and meaning of the Specifications for the amount stated in his proposal and without additional cost to the Owner.

ADDENDA

The bidder may, during the bidding period, be advised by addenda of additions or alterations in the Specifications. All such changes shall be included in the work covered by the Proposal and shall become a part of the Contract Documents.

TAXES

The Contractor affirms that all applicable Federal, State and local taxes of whatever character or description are included in his proposal.

CONTRACT

Within ten (10) days after being notified of the acceptance of the proposal, the bidder to whom the award is made will be required to enter into a written agreement in the form hereto attached with the Plainwell Paper Company.

REQUIREMENTS FOR SIGNING BIDS

Bids which are not signed by the individual making them should have attached thereto a power of attorney evidencing authority to sign the bid in the name of the person for whom it is signed.

Bids which are signed for partnership should be signed by all of the partners or by an attorney in fact. If signed by an attorney in fact, there should be attached to the bid, a power of attorney evidencing authority to sign the bids executed by the partners.

Bids which are signed for a corporation should have the correct corporate name thereof and the signature of the president or other authorized officer of the corporation below the name follow-in the work "By".

TIME OF STARTING AND COMPLETION

Time is of the essence with this Contract. It is understood that the work is to be carried through to completion with the utmost speed consistent with good workmanship.

The successful bidder shall commence active work on the project within ten (10) days after date of Notice of Award, unless a longer period is stated in such notice, and shall complete the work within the time stated in the Contract.

The Contractor shall state in his Proposal the number of calendar days (not working days) which he will require to complete the work. The Contractor shall give a firm date for the completion of the Contract.

FEES FOR ADDITIONAL WORK

Each bidder shall state in his Proposal the fees which he agrees to accept for additional work performed upon authorization from the Owner.

SUBSTITUTIONS

All Proposals shall be based strictly on the products listed in the Specifications. The Contractor may, however, submit with his Proposal similar products in lieu of those specified, providing the difference in cost, if any, is given in each case.

The Owner has the option to approve substitutions and differences in cost, if any, or elect to accept only the products as listed in these Specifications.

When two or more items are listed in the Specifications or on the Drawings as being satisfactory for a particular application, Plainwell Paper Company is to have the option of making a choice unless the Contractor lists a particular choice in his base bid.

SUBCONTRACTORS TO BE EMPLOYED

The Contractor shall list in his Proposal all the names of his subcontractors. The Contractor shall clearly define the scope and extent of the work to be accomplished by each of the subcontractors.

NAME OF BIDDER: _____

ADDRESS _____

_____ ZIP CODE _____

TELEPHONE _____

PROPOSAL FOR Water Pollution Abatement - Phase IIA Work

OWNER Plainwell Paper Company
Plainwell, Michigan

P R O P O S A L F O R M

Plainwell Paper Company
Plainwell, Michigan 49080

Gentlemen:

In response to your invitation for bids the undersigned submits the following offer to enter into a Contract with the Plainwell Paper Company and extends this offer for thirty (30) calendar days subsequent to the opening of bids. This offer has been prepared after our examination of the complete Plans and Specifications, together with their related documents, and our examination of the conditions surrounding the construction of the proposed work including the availability of materials, equipment and labor. Included in this offer are all costs necessary to complete the water pollution abatement - Phase IIA work in accordance with the Contract Documents prepared by Commonwealth Associates Inc., within the time set forth herein for the sum of _____ Dollars ($_____) which amount also includes the following Addenda:

No. 1, dated _____

No. 2, dated _____

No. 3, dated _____

No. 4, dated _____

FEES FOR ALTERATIONS AND ADDITIONS

The undersigned agrees that he will, when so instructed by the Owner, perform alterations and additional work for the following fees:

1. For extra work performed, with written authorization, by the Contractor's own forces-direct cost plus ____%. (Includes fee, overhead and profit.)

2. For extra work performed, with written authorization, by subcontractors - direct cost plus ____%. (Includes fee, overhead and profit.)

SUBSTITUTIONS

The undersigned proposes the following substitutions for materials or work specified, it being understood that should any such substitutions be accepted the applicable amount or amounts hereinafter listed are to be added to or deducted from the Base Proposal as stated:

COMPLETION OF WORK

If awarded the Contract, the Undersigned agrees that time is an essential condition of the Contract and will complete all of the water pollution abatement - Phase IIA work on or before _____.

The undersigned agrees to complete the work within _____ consecutive calendar days after the date of official award of the Contract.

ACCEPTANCE OF PROPOSAL

The undersigned agrees to execute a Contract for work covered by this Proposal provided that he be notified of its acceptance within thirty (30) days after the opening of the Proposal.

Name of Bidder _____

Date _____ By _____

In Presence of: (typed name) _____

_____ _____

(title)

PLAINWELL PAPER COMPANY
Plainwell, Michigan
Water Pollution Abatement - Phase IIA Work

AGREEMENT

This agreement made this _____ day of _____ 1975, by and between _____ having its principle offices in _____ hereinafter called the "Contractor", and the Plainwell Paper Company, having its principle office in Plainwell, Michigan, hereinafter called the Owner.

WITNESSETH, that the Contractor and the Owner, for the consideration stated herein, agree as follows:

ARTICLE 1 - SCOPE OF CONTRACT

1A. The project is detailed more completely in the Specifications and Drawings, but generally consists of the following work:

> Separation of in-plant roof, cooling and process waste sewers; improvements to the aeration lagoon and secondary clarifier; new wet well pumps and pump building; chemical feeding facilities; alterations to primary clarifier; and wiring of motors, controls and associated interlocks.

1B. The Contractor shall furnish all labor, superintendence, materials, tools, equipment, accessories and services required to accomplish in a workmanlike manner, the water pollution abatement - Phase IIA work for the Plainwell Paper Company, as briefly outlined in ARTICLE 1A, and more specifically described in the Drawings and Specifications, including any and all addenda, as prepared by Commonwealth Associates Inc., which altogether constitute a part of this Agreement.

ARTICLE 2 - THE CONTRACT PRICE

The Owner shall pay to the Contractor for the performance of this Contract, subject to any additions or deductions provided therein, in current funds, the Contract price computed as follows:

Basic Bid Contract	$_____
Accepted Alternates	$_____
Complete Contract	$_____

ARTICLE 3 - PAYMENTS

Payments are to be made to the Contractor in accordance with and subject to the provisions embodied in the documents made a part of this Contract.

ARTICLE 4 - THE CONTRACT DOCUMENTS

The Contract consists of the following component parts, all of which are as fully a part of this Contract as if herein set out verbatim or, if not attached, as if attached hereto:

Invitation for Bids
Instructions to Bidders
Proposal Form
This Agreement
General Conditions
Special Conditions
Specifications, including addenda Nos. _____
Drawings

ARTICLE 5 - LIST OF DRAWINGS

M-102	Site Plan
M-103	Basement Drainage and Chemical Feed Piping
M-104	Roof Drainage Buildings 10, 12, 15, 16 and 23
M-105	Roof Drainage Sections and Details
M-106	Roof Drainage Buildings 9, 10, 11, 11A, 12
M-107	Roof Drainage Sections and Details
M-108	Roof Drainage Buildings 4, 5, 6, 7 and 9
M-109	Boiler House Sump and Pumping Station Plan
M-110	Boiler House Sump and Pumping Station Details
M-111	Ammonia Pump Plan and Connection Details
M-112	Alum Unloading Station and Sewer Plan
M-113	Alum Pump Plan and Connection Details
M-114	Phosphoric Acid Tank and Pump and Polymer Feed System Plan and Connection Details
M-115	Wet Well Pumps and Bar Screen Assembly Plan
M-116	Wet Well Pumps and Bar Screen Assembly Details
M-117	Bar Screen Chamber Details
M-118	Details

M-119	Modifications to Aeration Lagoon and Secondary Clarifier
M-120	Modifications to Primary Clarifier
M-121	Electrical Schematics
M-122	Electrical Details
M-123	Instrumentation Diagram

ARTICLE 6 - COMPLETION OF WORK

If awarded the Contract, the undersigned agrees that time is an essential condition of the Contract and will complete all of the water pollution abatement - Phase IIA work on or before _____.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement, the day, month and year first above written.

Sign, Sealed and Delivered
in the presence of:

_____
(Contractor)

_____ By _____

_____
(Title)

Plainwell Paper Company

_____ By _____

_____
(Title)

GENERAL CONDITIONS

GENERAL:

Unless otherwise specified the drawings and specification are intended to include everything obviously requisite and necessary to the proper and entire finishing of each branch or trade of the work mentioned, with exceptions as noted. Accordingly, all work is to be done under all headings in connection with the work to carry out the drawings and specification whether each item is mentioned herein or not.

Where sheet numbers of drawings are mentioned throughout the specification in connection with the various headings, it has been done for the purpose of supplementing the descriptions contained in the specification and as a convenience to the Contractor in taking off quantities and referring to the work described.

In connection with his solicitation of sub-bids for any one or more trades, the Contractor shall be held to have made available to all parties interested full and complete information that pertains to other related trades in addition to that which relates to a specified individual trade.

The clauses in these General Conditions, unless otherwise mentioned, are to apply to all parts of the work, and the Contractor shall be responsible for same whether the term "Contractor" or "Sub-Contractor" is used in these General Conditions and in the Specification.

Where reference is made to "Plumber, Electrician, Mason" or other craftsmen in the trade sections of the specifications, it shall be construed to refer to the tradesmen or Contractors employed by the General Contractor in carrying out the work described under the various headings.

DESCRIPTION OF THE WORK:

The work under this contract consists of all trades necessary to complete the project.

ACCESS ROADS:

Under his contract the Contractor shall build such temporary roads as may be required for his continuous construction operations within and around the site. These temporary roads shall be available for use by the Owner and other Contractors working under the Owner's directions; and, during the operations of the Contractor, shall be kept free by him for access to the public highways and to those areas of the site that are included in the work of his contract, and shall be maintained during the period of this contract and removed by him as directed by the Owner.

RAILROAD SIDING:

Railroad tracks are available at the site. The Contractor may use these tracks in conjunction with the Owner.

The Contractor shall so schedule his work as to avoid interference with the Owner's operations.

PROCEDURE OF WORK:

Certain areas on the site, or entire areas of existing buildings on the site will be occupied for use by the Owner, or for the purpose of making additions or alterations to the existing structures or installations therein with his own forces, or by others at the same time work is being performed by this Contractor or other Contractors. The Contractor, the General Contractor and other Contractors shall therefore cooperate with the Owner and others under his jurisdiction in the expeditious performance of the work of all parties; and the Owner shall likewise cooperate fully to permit the expeditious performance of all Contractors.

The Contractor shall arrange to work all necessary shifts, overtime, including week-ends, holidays and Sundays required to complete the project as scheduled.

All Contractors shall, in the performance of their work, use such equipment and so operate as to reduce to the minimum, dust and dirt, accumulation of water and excavated materials, and shall keep the building sites drained at all times to avoid conditions detrimental to the Owner's use and occupancy of the premises.

The Contractors shall make all provisions necessary in connection with their operations for adequately protecting existing work, contents and occupied areas from all damage of whatsoever nature, and shall cooperate so as not to disrupt any of the Owner's operations.

LAWS, ORDINANCES AND REGULATIONS:

The Contractor shall be held to be fully informed of all Federal, State and local laws, ordinances, building rules and regulations and other statutory provisions, all as are, or may become, applicable to the work and to all actions, omissions or operations in the performance of the work. He shall comply therewith and shall give all reports, stipulations and representations required thereby and shall require similar compliance, reports, stipulations and representations by all others with whom he shall enter into any contract and/or commitment pertaining to the work.

It shall be the duty of the Contractor, before starting any work, to ascertain whether the Specification and drawings are at variance with any such laws, ordinances, rules and regulations or other statutory provisions and to notify Owner promptly, in writing, or such variances, should they exist, to permit proper determination by Owner. If the Contractor performs any work contrary to such laws, ordinances, rules and regulations and other statutory provisions, he shall bear all costs in effecting compliance therewith.

The Contractor shall be liable for all damage or loss arising by reason of breach of the provisions herein set forth and shall indemnify and hold the Owner harmless from any and all liability for damage or loss on account of such breach.

Where the Contractor requires the work, or any parts of same, to be above the standards required by applicable laws, ordinances, rules and regulations and other statutory provisions pertaining to the work, such work shall be performed and completed by the Contractor in accordance with the Contract requirements.

PERMITS:

The Owner shall obtain and pay for the general Building Permit. The Contractor shall obtain and pay for any other permits and/or licenses required in connection with his work.

The Contractor shall pay all inspection fees required in the performance of his work and shall deliver required certificates of inspection to the Owner.

TAXES:

The Contractor shall include in his proposal and shall make payment of all Federal, State, County and Municipal taxes now in force, or which may be enacted during the progress and completion of the work covered, and Michigan State Sales and Use Taxes.

PATENTS:

The Contractor shall, without additional cost to the Owner, pay all royalties and license fees necessary for the full and free use and enjoyment by the Owner of any and all rights to any inventions, articles, machines,

devices, processes or methods which may be applied or incorporated as part of the work either in the construction or use after completion.

The Contractor shall, at his own cost and expense and without reimbursement by the Owner, defend all suits or claims for infringements of any patent of other rights and shall forever save the Owner harmless from damage or loss on account thereof.

INTENT OF SPECIFICATIONS AND DRAWINGS:

The Specification and drawings are intended to describe the work and to furnish sufficient information to indicate what is necessary for the construction of the work, complete in all details.

Except as otherwise specifically stated in the Contract, the Contractor shall provide and pay for all permits, taxes, insurance, materials, labor, tools, equipment, water, light, heat, power, transportation, supervision, temporary construction, and all services and facilities of every nature whatsoever necessary for the performance of the Contract, complete and within the agreed time.

The Specification and drawings are intended to be complimentary, and what is called for by either shall be as binding upon the Contractor as if called for by both. The work shall be complete, in every detail; however, should any work or any material be required which is not denoted in the Specification or on the drawings, either directly or indirectly, but which is nevertheless necessary for the proper carrying out of the intent thereof, the Contractor agrees the same to be implied and required and shall perform all such work and furnish all such material as fully as if they were particularly delineated or described and without additional cost to the Owner.

The Contractor shall not avail himself of any manifestly unintentional error, omission or inconsistency, should such exist. Should any such error, omission or inconsistency appear in the Specification or in the drawings, the Contractor, before proceeding with the work, shall call the Owner's attention to same for proper determination, and in no case shall the Contractor proceed with the work in uncertainty. In case of such error, omission or inconsistency, unless there is sufficient evidence reasonably to establish otherwise, the provisions of the Agreement will take precedence over the Specification and the provisions of the Specification will take precedence over the drawings, in case of inconsistencies between the scales and figures, the figured dimensions on the drawings will govern, and large-scale details will take precedence over small-scale details.

Large scale or full-size details, when furnished by the Owner to the Contractor after award of Contract, will be developed from the scale drawings. Should such details differ from the intent of the scale drawings or not be reasonably inferable therefrom and such difference result in additional expense to the Contractor, the Contractor shall, immediately upon receipt of such details, call the Owner's attention to same, in writing, for proper determination No adjustment in the Contract price in respect thereof will be made to the Contractor unless he receives a written order with respect thereto from the Owner before starting the work covered by said detail.

With respect to any parts of the work for which only a portion is completely drawn or detailed, or which are indicated on the drawings for any particular area or location, all like work shall conform to the portion so drawn or detailed and shall be deemed to continue throughout like areas or locations unless distinctly shown or noted otherwise.

While the Specification may be divided into trades, sections, headings and sub-headings, the Contractor shall furnish all labor and materials necessary to provide a complete piece of work as contemplated by the Specification and drawings. Any item called for under any one specification subdivision must be supplied even though it is not called for again under the subdivision for the particular work. Regardless of such subdivision by trades, sections, headings and sub-headings as they appear in the Specification, the Contractor shall be responsible for the classification and allocation of the performance of the work and of the furnishing of all labor and material in connection therewith to avoid any delays which may otherwise result from conflict with local customs, rules, jurisdictional awards, regulations, decisions and the like, in so far as same may be applicable to the work.

MEASUREMENT AND FITTING OF PARTS:

The Contractor shall take all the necessary field measurements and otherwise verify all dimensions shown on the drawings, including the Contractor's, Subcontractor's and manufacturer's shop drawings. Should any error or inconsistency exist, the Contractor shall not proceed with the work affected thereby until he shall have reported the same to the Owner and shall have received from the Owner clarification or correction.

The Contractor shall, without extra charge, make adjustable parts fit to fixed parts. He shall coordinate all portions of the work under the Contract prior to fabrication and/or installation and shall do all required cutting and altering of and fitting to, any portion of his work to make its several parts fit together and to make possible installation of adjoining portions of the work and to fit work already in place.

The Contractor shall not cut or alter the work of any other Contractor without the consent of the Owner.

QUALITY OF MATERIALS AND WORKMANSHIP:

All work shall be done by persons qualified in their respective trades, and the workmanship shall be first-class in every respect. All materials and equipment furnished shall be the best of their respective kinds for the intended use and, unless otherwise psecified, same shall be new and of the latest design. The Owner shall make all decisions with respect to questions concerning the quality or fitness of materials, equipment and workmanship.

OWNER'S OPTIONS:

Unless otherwise stated in the Agreement, where the choice of more than one make or type or style of article or material is specified, the final

selection of the make, type or style rests with the Owner; where the Specification calls for a stipulated item "or other approved", or other words to that effect, the Contractor shall furnish the make, type or style specified.

APPROVAL OF EQUIPMENT AND MATERIAL MANUFACTURERS:

The Contractor, immediately after being awarded the Contract, shall submit to the Owner a schedule listing the name of the manufacturer and type, in each case, of all material and equipment to be furnished by the Contractor and his respective Subcontractors, for approval of the Owner.

SAMPLES TO BE SUBMITTED:

The Contractor shall furnish to the Owner, for approval when requested or when required by the Specifications, samples of all materials and finishes to be used in the execution of the work. Such samples shall be of sufficient size to be representative and shall be submitted in such numbers as required before the work is commenced and in ample time to permit examination thereof. All materials furnished and finishes applied shall be fully equal to the approved samples; however, neither the Contractor's furnishings nor the Owner's approval of samples shall relieve the Contractor of his obligation to comply with the full requirements of the Contract.

REVIEW OF CONTRACTOR'S DRAWINGS:

The Contractor shall furnish to the Owner, all Contractor's, Subcontractor's and manufacturer's shop drawings, and other drawings which may be required by the Specification, requested by the Owner or otherwise necessary for the proper execution of the work.

Unless otherwise provided, not less than four (4) copies of allsuch drawings shall be submitted to the Owner for review. The Contractor shall submit all such drawings to the Owner in sufficient time to prevent delays in delivery of materials or in the progress or completion of the work, and in the order in which materials are needed at the site without necessarily waiting for completion of all drawings before submitting part of them.

All Subcontractor's and manufacturer's drawings shall first be sent directly to the Contractor, who shall keep a record of the drawing numbers and dates of receipt. The Contractor shall check thoroughly all such drawings, as regards measurements, sizes of members, materials and all other details, to assure himself that they conform to the intent of the Owner's drawings and the Specification, and shall promptly return to the Subcontractors and/or manufacturers, for correction of the drawings as are found inaccurate or otherwise in error. After the Contractor has checked and approved such drawings, he shall place thereon the date of such approval and the signature of the checker and shall then submit them to the Owner for review.

The Owner reserves the right to refuse to check or review any drawings of a Subcontractor or manufacturer which are not submitted in compliance with the foregoing requirements.

The Owner will check and review the Contractor's, Subcontractor's and manufacturer's drawings within a reasonable time after receipt thereof and will return all but three (3) copies of each to the Contractor, endeavoring to indicate, by notations thereon by written instructions, or other directions, any corrections which in the opinion of the Owner, may be necessary to meet the Contract requirements. The Contractor shall then review such notations, instructions, or directions and if he concurs therein, shall make or have made such required corrections, and shall when requested by the Owner, re-submit corrected drawings to the Owner as soon as possible, for final check and review. Should the Contractor question or dissent from such notations, instructions or directions, he shall direct the Owner's attention to same for further clarification before resubmitting same.

The checking and review of Contractor's, Subcontractor's and manufacturer's drawings by the Owner is a gratuitous assistance, and the Owner does not thereby assume responsibility for errors or omissions. Such errors or omissions must be made good by the Contractor, irrespective of the receipt, checking or review of the drawings by the Owner, and even though the work is done in accordance with such drawings.

The Contractor shall, upon completion of the work, furnish to the Owner a complete set of prints, neatly bound together and in good condition, if all Contractor's, Subcontractor's and manufacturer's drawings as finally checked and review of the Owner with all modifications approved by the Owner subsequent thereto, showing the work as actually completed.

OWNER'S STATUS:

The fact that the Owner or the Owner's Superintendent has not made early discovery of faulty work or of owrk omitted or of work performed which is not in accordance with the Contract requirements or that the Owner's Superintendent has permitted faulty work to be done or has permitted omissions in the work or has permitted work to be done which is not in accordance with the Contract requirements shall not bar the Owner from subsequently rejecting or condeming such faulty work and from insisting that the Contractor make all work right.

Neither the Contractor nor any of his Subcontractors nor any persons either directly or indirectly engaged or employed by any of them shall have any claim against the Owner or the on account of any damage, loss or expense which they may incur because of their being required to complete work omitted, to correct faulty work or to make right work performed at variance with the Contract requirements and the Contractor shall hold harmless the Owner and the Owner from any liability for damage, loss or expense which may arise by reason thereof or by reason of any act or omission of the Contractor or of any of his Subcontractors or of any persons either directly or indirectly engaged or employed by any of them in the performance of the work, or any portion thereof, which may be at variance with the requirements of the Contract, regard-less of whether such damage, loss or expense has occurred prior to, during or

subsequent to the discovery, rejection and/or condemnation by the Owner or the Owner's Superintendent of such faulty work, work omitted and/or work at variance with the Contract requirements.

Where the Contract, including amendments thereto, provides for decisions, determinations, orders, certifications, opinions, directions, or other actions by the Owner and/or the Owner's Superintendent, the same shall be final and binding upon the Contractor and the Owner.

INSPECTION OF WORK AWAY FROM PREMISES:

When any portion of the work is to be performed away from the premises, the Contractor shall notify the Owner, in reasonable time, where and when such work is to be done and shall make arrangements for access thereto by the Owner in order that the same may be inspected by the Owner, if he so desires, from time to time before delivery thereof to the construction site.

When required in writing by the Owner the Contractor shall make all tests in addition to those specifically called for elsewhere in the Contract, as may be necessary to determine whether the requirements of the Contract have been fulfilled; and shall, if so directed, engage an approved testing laboratory for making same. The Contractor shall provide all required materials, labor, apparatus, services and facilities in connection therewith.

Should such additional tests show, in the opinion of the Owner, that the requirements of the Contract have been fulfilled, then the cost of same shall be paid for by the Owner.

Should such additional tests show, in the opinion of the Owner, the work or materials to be defective or otherwise not meeting the requirements of the Contract, the Contractor shall, immediately upon notification by the Owner, remove, replace or reconstruct same, as the case may require, and shall, if directed by the Owner, make such further tests as may be necessary to determine fulfillment of the Contract requirements; the costs of all such tests and re-tests shall be borne by the Contractor.

All tests shall be made under the supervision and direction of the Owner, except that those required by a public authority shall be under the supervision and direction of such authority.

REMOVAL AND CORRECTION OF WORK AND MATERIALS:

All faulty work shall be made right by the Contractor without delay. The Contractor shall immediately remove and replace all materials and work which are of unsound or unfit character or which otherwise do not meet the requirements of the Contract; shall remove, reconstruct or refinish, as the case may require, all materials and work which have become damaged after they are in place; and in each instance shall make good other work affected thereby, all as directed by and to the satisfaction of the Owner. Except as specifically provided under the Section hereof entitled "Owner's and Contractor's Responsibilities for Fire and Extended Coverage Insurance Hazards", all of the fore-

going shall be done without expense to the Owner.

When required by the Owner, the Contractor shall expose work which has already been covered as may be necessary to determine whether the requirements of the Contract have been fulfilled. Should examination of such exposed work show, in the opinion of the Owner, that the requirements of the Contract have been fulfilled, then the cost of such uncovering and reconstruction shall be paid for by the Owner. Should examination of such exposed work show, in the opinion of the Owner, the work or materials to be defective or otherwise not meeting the requirements of the Contract, then immediately upon notification by the Owner the Contractor shall replace and reconstruct same and the costs of all such uncovering, replacement and reconstruction shall be borne by the Contractor.

No extension of time will be allowed in connection with the correcting of faulty work.

Should the Owner deem it inexpedient, in any particular instance, to have the Contractor correct faulty or damaged materials and/or work, the Contractor, when requested in writing by the Owner, shall offer an allowance, as a deduction from the Contract amount, in lieu thereof. Acceptance by the Owner for such allowance shall not modify the requirements of the Guarantee called for by the Contract. If the allowance is not approved by the Owner and/or acceptable to the Owner, the Owner shall have the right to require the Contractor to correct such fsulty or damaged materials and/or work as hereinbefore provided.

ALTERATIONS AND ADDITIONS:

The Owner shall have the right, and the Contractor acknowledges such right to require by written order, alterations in, additions to and deductions from the work required under the Contract without in any way rendering void the Contract. Such alterations, additions, or deductions may be described in a Bulletin, with or without accompanying drawings, issued by the Owner or in the written order itself. The Contractor when so ordered in writing, shall proceed promptly in accordance with said order and the Contract price shall be adjusted, as the case may require, for such changes in accordance with the provisions hereinafter stated.

Unless the adjustment in Contract price has been previously agreed upon and is stated in the written order, the Contractor shall submit to the Owner, promptly and in any event within 14 days from receipt of such bulletin or order, his written statement or estimate of the additional cost or credit if any, as the case may require, because of the changes proposed or ordered and shall within 30 days from receipt thereof, submit a firm quotation in writing. Such quotation shall be based on a fair and reasonable evaluation of the work added or omitted and shall be subject to the approval of the Owner and the acceptance of the Owner.

Each such bulletin or order shall be reckoned as a unit complete and the Contractor's quotation thereon shall be enumerated in detail as to labor, materials and other items, and shall be supported by any further information which the Owner may request, to permit checking by the Owner or by some other competent person appointed by him.

The value of the work shall be computed on the basis of unit prices if unit prices are stated in the Contract; and for such portions of the work as are not covered by unit prices, on the basis of estimated cost of labor and material; or on the basis of actual cost to the Contractor; all is hereinafter provided under "Methods of Evaluation".

When such bulletin or written order comprises several distinct and seperate items of work, the net aggregate quantities of like materials and labor hours included in all items should be determined and, except as paragraph (c) of method #1 may apply, the appropriate unit price or unit cost, as the case may be, shall be applied to such net aggregate quantities.

Unless said itemized quotations are submitted within thirty (30) days from receipt of the bulleting or written order covered thereby, or within such further time as the Owner may allow, in writing to the Contractor, the Contractor agrees to increase in the Contract price shall be made; however, if in the opinion of the Owner a credit is due, the Owner shall so notify the Contractor, in writing, and such claim for credit shall be adjusted to the mutual satisfaction of the Contractor and Owner before final payment will be made.

The Contractor shall include in all of his subcontracts, and otherwise as may be necessary, provisions to enable him to secure his Subcontractor's estimates, quotations and material prices to comply with the foregoing requirements.

METHODS OF EVALUATION:

#1 - Unit Prices:

(a) Unit prices shall be net to the Owner for work in place and shall include all applicable taxes, insurance, overhead and profit, as well as all charges for incidental expenses, such as hoisting, cleaning, painting, cleaning up rubbish, etc., the intention being to leave the respective items finished, the same as required for similar work under the original Specification and General Conditions. Such unit prices shall govern for additions and deductions in connection with the buildings, structures and installations covered by the Specification and drawings and also, if the Owner so elects, for other work located on the premises, incidental or necessary to the use of said buildings, structures or installations, which may be required.

(b) For changes in quantity of the same material, the appropriate unit price in the Contract shall be applied to the net change.

(c) For substitutions of one material for another in the same location, the differential between the deduct unit prices shall be used, except:

(1) When such substitution involves a change in Subcontractor performing the work, or a change from a Subcontractor to the Contractor, and the value of the work is increased as a result of such substitution, then the differential between the add unit prices shall be used.

#2 - ESTIMATED COST PLUS FEE:

(a) For additions and revisions to the work to be performed by the Contractor's own forces, and not covered by unit prices, or, for other work located on the premises, if the Owner so elects, the price shall be based on the estimated cost of labor and materials plus rental for the use of such items of equipment as are properly allocable to the work and as have an individual value, when new, in excess of $500.00 plus taxes and insurance applicable thereto, plus bond premiums. For additional work or revisions resulting in additional work, there shall be added to the price as approved by the Owner the Contractor's fee as stated in the Contract, which fee shall constitute all of the Contractor's charges for supervision, field office expense, the making of all shop drawings, the services of any necessary draftsmen, engineers and layout men, tools (large and small) job and other overhead as well as profit. The Contractor's fee shall be applied to the net estimated cost of labor, materials and equipment rental only, exclusive of applicable insurance, taxes and bond premiums.

(b) For additions and revisions to the work to be performed by Subcontractors under the Contractor, and not covered by unit prices, or for other work located on the premises, the value of such work shall be computed by the Subcontractors in the same manner as described in paragraph (2) preceding (except that the Subcontractor's fees shall be as approved by the Owner and shall be checked and approved by the Contractor before submitting same to the Owner for his check and approval. For additional work or revisions resulting in additional work, there shall be added to the net aggregate of such Subcontractors' prices as approved by the Owner the Contractor's fee as stated in the Contract, which fee shall constitute all of the Contractor's charges for supervision, engineering, field office expense, job and other overhead as well as profit.

(c) Where revisions involve both additions and deductions, the values for labor and materials added and deducted shall be balanced against each other and the fees shall be applied to the net result of such balance in values when such result is an addition.

#3 - ACTUAL COST PLUS FEE:

Should the Owner so elect, the Contractor shall perform and shall require each of his Subcontractors to perform, revisions and additions to the work at the actual cost of labor and materials, and he shall keep and present, in such manner as the Owner may direct, an accurate account of his costs and of his Subcontractors' costs, together with all supporting vouchers. The sums to be paid by the Owner to the Contractor for such work shall be;

(a) The actual cost to the Contractor of all labor performed on and materials furnished for and used in the above work, less all trade and other discounts, and the rental cost to the Contractor for the use of such items of equipment which are properly allocable to the work and as have an individual value, when new, in excess of $500.00.

(b) All sums paid by the Contractor for royalties, permits and inspection fees.

#3 - ACTUAL COST PLUS FEE CONTINUED:

(c) All premiums for Contractor's Public Liability Insurance, Workmen's Compensation, Fire and other proper and necessary insurance, as well as all applicable payroll taxes.

(d) The actual amounts of the Subcontractors' costs, which costs shall be confined to items comparable to those allowed the Contractor under paragraphs (a), (b) and (c) preceeding, plus the Subcontractors' fees as approved by the Owner. These fees shall be applied to the cost of labor, materials and equipment rental only and shall constitute all of the Subcontractors' charges for overhead and profit, including, but not limited to items comparable to those enumerated in paragraph (f) following.

(e) The expenses of making good any damage to the work or premises and the removal and replacement of materials or work rejected or condemned by the Owner as failing to conform with the requirements of the Specification and drawings which, in the opinion of the Owner has resulted from a lack of reasonable diligence on the part of the Contractor or his Subcontractors, shall be borne by the Contractor and shall not be charged as items of cost.

(f) The Contractor's fees, mentioned in the Contract, which constitute all of his charges for overhead and profit, both direct and indirect, including, but not limited to:

(1) The services of the Contractor, his general office organization and the services of his superintendent (but not the foremen employed continuously at the building on this work).

(2) All field office expense.

(3) The use of all tools required for the execution of the work.

(4) The making of all shop drawings.

(5) The services of any necessary draftsmen, engineers and layout men.

Should the Owner order the Contractor to proceed with revisions or additions to the work involving the use of Method #2 prior to the submission, approval and acceptance of the Contractor's quotation as hereinbefore provided, the Contractor shall keep an accurate account of his and his Subcontractors' costs of the work so ordered, together with all supporting vouchers, in the same manner as required under Method #3. Upon the submission, approval and acceptance of the Contractor's quotation, the Contractor shall continue and complete the work and further account of actual costs. Should the price involving the use of Method #2 not be approved by the Owner or not be acceptable to the Owner, then, except as otherwise ordered by the Owner, the Contractor shall continue and complete and shall require each of his Subcontractors to continue and complete said revisions and additions on the basis of actual cost, as provided in Method #3 and shall present to the Owner an account of his costs and of this Subcontractors' costs, together with all supporting vouchers. Said accounts shall be subject to audit by the Owner.

No claim by the Contractor for increased compensation for alterations or additions, except when done in pursuance of a written authorization from the Owner (drawings without a written order shall not constitute such authority) will be considered unless written notice of claim is made to the Owner before the commencement of such work.

BILLS FOR EXTRAS:

Bills for extra work authorized in writing by the Owner (other than additional work provided for in the Contract) shall be itemized in detail as to labor, material and other charges and shall be submitted to the Owner in writing, on demand, and in any event, before final certificate for payment on account of the Contract will be issued. Unless otherwise agreed, no payment on such bills will be made until final settlement.

SCHEDULE OF VALUES AND ALLOCATION OF OWNER'S COST:

Prior to application for the first payment under the Contract, the Contractor shall submit to the Owner a schedule of values of the several divisions and subdivisions of work entering into the Contract, to be used as the basis for partial payments. This schedule of values shall be in such form as may be approved by the Owner and shall aggregate the total Contract price.

The Owner shall have the right to require the Contractor to alter the value of the individual items listed on the schedule at any time if the same shall appear to be incorrect or unbalanced, but no such laterations shall affect the total Contract price.

The Contractor shall, without additional charge, furnish from time to time, as requested, such additional segregation of values as may be required by the Owner for the purpose of allocating costs of the various individual buildings, structures, and each equipment installation therein or connected therewith.

PAYMENTS TO THE CONTRACTOR:

Applications by the Contractor for partial payment as the work progresses shall be submitted to the Owner for approval. Each application shall be accompanied by: (1) a written, tabulated estimate by the Contractor of the value of work completed to the date thereof, based on the approved Schedule of Values for various portions of the work and all authorized additions and deductions to the contract price, which estimate shall represent the proportion which the work completed bears to the total work, and (2) a sworn statement by the Contractor as to the status of all labor, material and Subcontract accounts as of the date of the application. The Contractor may, if the Owner approves, include in said estimate, as work completed, the value of materials or prepared work delivered to the site but not installed. Subject to the Contractor's compliance with the foregoing and the Owner's approval of the estimate, in each case, will issue a certificate to the Owner as to the amount due for partial payment by the Owner in accordance with the terms of the Contract.

Upon completion of all the work under the Contract and acceptance thereof by the Owner the Contractor shall make application for final payment. The application shall be accompanied by (1) the Contractor's written statement of the amount due, (2) the Contractor's sworn statement as to the status of all labor, material and Subcontract accounts, (3) the Contractor's Waiver of Lien in full, and (4) all required Guarantees. Subject to the Contractor's compliance with the foregoing, the Owner will issue the final certificate as to the amount due, for final payment by the Owner in accordance with the terms of the contract.

Neither the final payment, nor any part thereof, shall become due and payable until the Contractor, if requested by the Owner, shall have delivered to the Owner, eveidence satisfactory to the Owner that the Subcontractors and all labor and material bills in connection with the work have been paid in full, a complete release of all liens arising out of the Contract or receipt in full in lieu thereof, and a sworn statement that the release and/or receipts cover all labor and materials for which a lien could be filed.

The Contractor may, if any Subcontractor refuses to furnish a release or receipt in full, furnish a bond, satisfactory to the Owner, to indemnify the Owner against any lien of such Subcontractor.

All sworn statements, releases and waivers of lien shall be in the respective forms bound herein which forms the Contractor shall modify as necessary to meet the requirements of the Mechanics Lien Laws of the State where the work is being performed. They shall be signed by a duly authorized person, properly notarized, and shall be subject to the approval of the Owner.

No materials, equipment or prepared work delivered upon the premises, whether or not payment has been made on account thereof, shall be removed from the premises without the prior written consent of the Owner's Superintendent or the Owner.

No certificates shall be issued in favor of the Contractor for materials not delivered upon the premises.

Neither the issuance of certificates, nor any payment under the Contract, nor the occupancy, use, or operation, by the Owner, of the premises, including buildings and installations, whether partial or entire, shall be construed as evidence of satisfactory progress or as evidence of the performance of the Contract, either wholly or in part. No payment shall be construed to be an acceptance of defective work or improper materials. No payment of certificates, final or otherwise, shall be construed to relieve the Contractor from his obligations to make good any defects in his work arising or discovered within the period of his guarantee.

The Owner shall have the right to withhold certificates for payment if, in his opinion, the work is not being done or pregressing satisfactorily, until such time as the progress or character of the work has, in his opinion, been made satisfactory.

The Owner shall also have the right to withhold or, on account of subsequently discovered evidence, to nullify the whole or a part of any certificate to such extent as may be necessary to protect the Owner from a loss on account of:

(1) Defective work not remedied, or work not meeting the requirements of the Contract;

(2) A reasonable doubt that the Contract can be completed for the balance then unpaid;

(3) Damage to another Contractor;

(4) Claims arising from failure to make payment to Subcontractors.

LIENS:

The Contractor expressly waives the benefits of the Mechanics Lien Laws of the State in which the work is being done. As a condition of any payments whatsoever by the Owner on account of the Contract, or on account of any orders for additions or revisions thereto, the Contractor shall, upon request of the Owner, procure from each and every one of his Subcontractors and suppliers of material or labor a waiver of lien or a release of any claim to a Mechanics Lien which they or any of them may have under the Mechanics Lien Laws of the State in which the work is being done, and shall furnish the same to the Owner together with each and every other document, sworn statement or assurance which, in the opinion of the Owner, is necessary or appropriate to establish that the property is free from Mechanics Liens on account of anything which is done by the Contractor, or those acting under him, or his subcontractors, in the performance of the work under the Contract and any and all orders for additions and revisions thereto. Any payments made by the Owner without requiring strict compliance with the terms of this paragraph shall not be construed as a waiver by the Owner of the right to insist upon strict compliance with the terms of this paragraph as a condition of later payments.

If, at any time, there shall be evidence of the existence, whether or not same has been asserted, of any lien or claim arising out of or in connection with the performance or default in performance of the Contract, and if the Owner or representatives of the Owner of any property of either or any property installed on the premises, might be or become liable for the discharge or satisfaction of such lien or claim, then the Owner shall have the right to retain out of any payment then due or thereafter to become due, in addition to the amounts otherwise retained under the Contract, an amount sufficient to discharge such lien or satisfy such claim and to reimburse the Owner and/or the representatives of the Owner for all costs and expenses in connection therewith, including cost of bonds and reasonable attorneys' fees, and shall notify the Contractor of such retention. The Owner, at his sole discretion, shall have the right to apply any amounts

retained by him to discharge or satisfy such lien or claim and pay all costs and expenses in connection therewith unless, within twenty (20) days after said notice:

(a) The Contractor has said lien or claim discharged or satisfied; or,

(b) Some other procedure, proposed by the Contractor and satisfactory to the Owner, is adopted to effect, within a reasonable period of time, the discharge or satisfaction of said lien or claim.

If the amounts retained are insufficient for the aforesaid purpose, or if any such lien or claim remains undischarged or unsatisfied after all payments have been made to the Contractor, then the Contractor shall reimburse the Owner for all sums in excess of the retained amounts, if any, or for the amounts that the Owner paid to discharge such lien or satisfy such claims, including the costs and expenses and reasonable attorneys' fees in connection therewith.

The Contractor shall include a provision satisfying the requirements hereinbefore specified as part of any and all Subcontracts entered into for the work or any portion thereof.

GUARANTEE:

The Contractor shall execute and deliver to the Owner, before final certificate will be issued, a written Guarantee, in the form bound herein, that all labor and materials furnished and work performed by the Contractor are in accordance with the requirements of the Contract, including all amendments thereto; that should any defect develop during the Guarantee periods, as hereinafter defined, due to improper materials, workmanship or arrangement, the same shall, upon written notice, be made good by the Contractor without expense to the Owner; and that any other work affected in correcting such defects shall also be made good.

The Guarantee period shall be for two (2) years unless a different period of time is expressly stated under any trade section of the Specification, in which case the Contractor's Guarantee shall, with respect to such trade or trades, be for the longer or shorter period so stated.

The Contractor's Guarantee shall cover all work under the Contract, whether or not any portion or trade has been sublet. In the event any portion of the work is performed by Subcontractors under the Contractor, the Contractor shall obtain from such Subcontractors their written Guarantees in the form bound herein, to the Owner covering their respective portions of the work for the periods specified, and the Contractor shall deliver these to the Owner together with his own Guarantee. These Subcontractors' Guarantees shall be enforceable directly by the Owner, if he so elects, and shall run concurrently with the Contractor's Guarantee.

The Written Guarantee by the Contractor is in addition to any guarantees, bonds or other stipulations required of Subcontractors under the various trade sections.

CONTRACTOR'S SUPERVISION - CLAIMS:

The Contractor shall keep on the work during its progress, a competent Superintendent and any necessary assistants, all satisfactory to the Owner. The Superintendent shall represent the Contractor on the site of the work and all directions given to him shall be as binding as if given to the Contractor. On request, all such directions shall be confirmed in writing to the Contractor.

If the Contractor shall contend that he is entitled to reimbursement from the Owner for increase in the cost of the work, damage or loss, as a result of such written directions for which provision is not elsewhere specifically included in the Contract, the Contractor shall within forty-eight (48) hours of the receipt of said direction, except in an emergency endangering life and property, notify the Owner in writing of his contentions, the amount of his claim with respect thereto, and all details in connection therewith, and shall not proceed upon such directions until he has received in writing acknowledgement and the claim by, and further instruction from the Owner. The Contractor shall comply with such instructions and unless said claim is finally disposed of by said acknowledgement and instructions, said compliance shall be without prejudice to the rights of the Contractor and Owner. In the event of an emergency endangering life or property, the Contractor shall proceed with that work necessary to protect life and property and shall keep accurate and complete records of the costs of such work, which records shall be presented to the owner as soon as the emergency ceases to exist.

If the Contractor shall contend that he is entitled to reimbursement from the Owner for increase in the cost of the work, damage or loss, because of the occurrence of any action of omission of others during the performance of the work, the Contractor shall not delay his work on account thereof and shall within seven (7) days after the first observance of such occurrence notify the Owner, in writing, of his contentions, the amount of his claim with respect thereto, and all details in connection therewith.

It is a condition precedent to the consideration or prosecution of such claims that the foregoing provisions be strictly observed in each instance, and if the Contractor fails to comply, the Contractor shall be deemed to have waived the claim. Neither the provisions of this Section nor the receipt of any claim by the Owner shall constitute admission on the part of the Owner that any such claim is valid.

Should the Contractor perform any work or should he proceed in any manner which he may subsequently allege has caused him increased cost, damage or loss, purporting, in each case, to have acted upon verbal instructions or approval or with tacit consent or acceptance, the Contractor shall be held to have done so at his own peril, and the Contractor shall have no claim against the Owner on account of such increased cost, damage or loss.

If the Contractor's Superintendent and/or any of his assistants prove unsatisfactory to the Owner, he shall be promptly replaced upon request of the Owner.

Any employee of the Contractor or of any Subcontractor whom the Owner considers detrimental to carrying out the work shall be promptly removed on the request of the Owner.

The General Contractor's Superintendent in charge of the project shall periodically inspect the entire project to make certain that all the stipulations under the Sections hereof entitled "Use of Premises and Moving of Materials", "Protection of Premises and Persons", "Plant Protection", "General Protection", "Fire Precautions","Fire Protection" and "Cleaning of Premises" are being observed.

CONTRACTOR TO ASSIST OWNER:

The Contractor shall render all necessary assistance to the Owner and, when requested or as otherwise required, shall take and furnish the Owner with levels, measurements, etc., with reference to the work or premises. The Contractor shall provide sufficient, safe and proper facilities at all times for the inspection of the work by the Owner.

CONTRACTOR'S MEETINGS:

At regular intervals there shall be held, at the job site, meetings of the representatives of the various trades engaged on the project to further the progress of the work. The time and place of these meetings shall be established by the Contractor with the approval of the Owner's Superintendent. These meetings shall be called by the Contractor who shall require attendance by representatives of all his Subcontractors. Representative of other Contractors not under the jurisdiction of the Contractor shall also attend these and special meetings when so requested by the Contractor or the Owner's Superintendent. The Contractor and the Owner's Superintendent shall each have the right to call additional or special meetings.

The Contractor shall keep a written record of each such meeting and shall transmit copies of such record, within four (4) days after each meeting, to the Owner and to all Contractors and Subcontractors interested in the matters covered.

All Contractors shall furnish to the Owner's Superintendent, immediately upon his request, all available information concerning the conditions and progress of their work.

COOPERATION:

The Owner may exercise his right, which right is hereby acknowledged by the Contractor, to let, independent of the Contract for the work herein specified, any other work on the premises even if of like character and trades, and the Owner shall not be liable for any damage, loss or expense incurred by the Contractor through the fault of any other Contractor so employed by the Owner. The Contractor acknowledges the necessity of work by others, to be performed at approximately the same time as the work hereunder, and agrees to perform his work in full cooperation with the work of such other trades and/or Contractors and to permit, without charge, access to and use of his work partially or entirely completed, by such other trades and/or Contractors, or by the Owne, when, in the opinion of the Owner's Superintendent, such access or use is necessary for the performance and completion of any portion or all of the work of others or of any work on the site.

Wherever any work being done by the Owner's forces or by other trades and/or Contractor or their Subcontractors is contiguous to, or required to be performed in advance of or subsequent to, the work of the Contractor or of his Subcontractors, the Contractor shall comply with the priorities and order of procedure of the several interest involved, as established by the Owner's Superintendent, to secure the early completion of the various portions of the work in general harmony and for the best interests of the work as a whole.

It is not incumbent upon the Owner to notify the Contractor when to begin, to cease or to resume work on individual operations; however, if, in the opinion of the Owner the coordination of the work of the Contractor with that of others engaged in work on the site is best served by a cessation of individual operations of the Contractor in any one area and/or the execution of his operations in another area, the Contractor shall, when so directed by the Owner's Superintendent, and regardless of the normal sequence of his own operations, effect such cessation and/or execution without additional cost to the Owner.

Where the work of the Contractor is to be installed in, or fitted to, or attached to, or in any manner integrated with, the work of another Contractor, the Contractor shall so advise such other Contractor in sufficient time to permit the installation, fitting, attachment or integration of said work in an orderly manner, shall furnish such other Contractor with drawings, details and other instructions required by said other Contractor to make proper provisions to receive said work and shall further so schedule and perform his own work to effect such correlation without delay. Where the work of another Contractor is to be installed in, or fitted to, or attached to, or in any manner integrated with, the work of the Contractor, the Contractor shall make all provisions in his own work necessary to receive same.

Should the Contractor fail so to properly inform or advise the other Contractor, or fail to furnish him with drawings and other information required, or fail to schedule and perform his work in sufficient time to effect the required correlation, or should the Contractor fail to make the necessary provisions to receive the work of another Contractor after receipt of due and early notification and of drawings and other necessary information from said other Contractor, then the cost of all cutting, patching and altering therein, fitted or attached thereto, or integrated therewith, shall be borne by the Contractor.

If the Contractor furnishes material or equipment to be installed by another Contractor, he shall notify such Contractor concerning delivery and, unless otherwise directed, shall deliver such material or equipment to the on-site warehouse or storeroom of the Contractor who is to install same. All such material or equipment shall be properly marked to indicate the intended location and use.

All material and labor shall be furnished and work performed at such time or times as shall be for the best interest of all Contractors concerned, to the end that all work will be properly coordinated and completed in accordance with the applicable schedules and the times of completion required by the contracts for the several portions of the work and the work as a whole.

CONTRACTOR'S RESPONSIBILITY FOR THE WORK:

The Contractor shall be responsible for his work and every part thereof, and for all materials, tools, apparatus and property of every description used in connection therewith.

Except as otherwise provided under the Section hereof entitled "Owner's and Contractor's Responsibilities for Fire and Extended Coverage Insurance Hazards", the Contractor assumes all risks, hazards and conditions in connection with the performance of the Contract including, but without being limited thereto, bad weather, delays in delivery of material or equipment, embargoes, strike and/or labor disturbances directed against the Contractor, his Subcontractors and/or other Contractors; and even if the performance of the Contract involves a greater expenditure of money than the Contractor expected at the time of award, the Contractor shall have no claim for reimbursement on account of such greater expenditure and no increase in the amount of the Contract will be made on account thereof.

ASSIGNMENT AND SUBLETTING OF CONTRACTS:

The Contractor shall not assign nor sublet the Contract as a whole without the prior written approval of the Owner; nor shall he assign or sublet any part of his work without the prior written approval of the Owner or specific party to whom it is proposed to assign or sublet the same.

Upon request of the Owner, in any event, within a reasonable time after award of the Contract, the Contractor shall submit to the Owner in writing, the names of the Subcontractors he proposes to use on any part or parts of the work.

Prior to the award of any Subcontract by the Contractor, the Contractor shall obtain from the Subcontractor and shall submit to the Owner for approval, unit prices and methods of measurement (not otherwise provided in the Contract), as well as percentage fees applicable under the Section hereof entitled "Alterations and Additions".

In any and all Subcontracts entered into between the Contractor and his Subcontractors, the Contractor shall bind each Subcontractor to accept, and each Subcontractor shall agree to accept all the provisions of the General Conditions, the specifications, addenda and drawings applicable to the work to be performed under the Subcontract.

The Contractor shall not assign all or any part of his interest in the Contract, or any sums due or to become due under the Contract, unless the instrument of assignment shall contain a clause substantially to the effect that the rights of the Assignee shall be subject to all the terms and conditions of the Contract and of all instruments that are now or may hereafter be amendatory thereof, or supplemental thereto, and to the rights and remedies of the Owner thereunder, or arising by operation of law, and to the liens of all persons, firms and corporations for services rendered or materials supplied in connection with performance of the Contract, and then only upon written consent of the Owner. Upon request of the Owner, the Contractor shall furnish evidence, satisfactory to the Owner, that the assignment contains the clause described herein.

No consent or approval of subletting or of assignment shall release or relieve the Contractor of any of the obligations and liabilities assumed by him under the Contract; and, as between the liabilities assumed by him under the Contract; and, as between the Owner and the Contractor, the Contractor shall remain responsible and liable for all acts and omissions of his employees, for the acts and omissions of Assignees and for the acts and omissions of his Subcontractors and of all persons either directly or indirectly employed by them, the same as if no subletting or assignment had been made. No such consent or approval nor any provision in the Contract shall create any contractual relation between the Owner and any Subcontractor or Assignee.

DAMAGE TO WORK:

Except as specifically provided under the Section hereof entitled "Owner's and Contractor's Responsibilities for Fire and Extended Coverage Insurance Hazards", the Contractor shall be responsible for all damage caused by his work, his workmen, or by his Subcontractors. The making good of damaged work and the making good of other work affected thereby shall be done by the party who installed the work, or by others as directed by the Owner, but the cost of same shall be paid by the Contractor.

CONTRACTOR'S LIABILITY FOR BODILY INJURY, SICKNESS, DISEASE, AND PROPERTY DAMAGE:

Except as specifically provided, with respect to property damage only, under the section hereof entitled "Owner's and Contractor's Responsibilities for Fire and Extended Coverage Insurance Hazards", the Contractor shall specifically and distinctly assume, and does so assume, all risk of damage or destruction of property or of bodily injury, sickness or disease of persons (including death resulting at any time therefrom) used or employed on or in connection with the work, and of all damage or destruction of property or of bodily injury, sickness or disease of persons (including death resulting therefrom), wherever located, resulting from any action, omission or operation under the Contract or in connection with the work. The Contractor shall secure, protect, defend, hold harmless, and indemnify the Owner against any liability whatsoever resulting from the bodily injury, sickness or disease (including death resulting at any time therefrom) of any person or persons, or the damage or destruction of any property, including loss of use thereof, based upon any act or omission, negligent or otherwise, of (a) the Contractor or any of its employees, agents, or servants, (b) any Subcontractor of the Contractor or any employees, agents or servants of such Subcontractor, or (c) any other person or persons, excepting only the Owner or any employees, agents, or servants of the Owner.

LIABILITY INSURANCE:

The Contractor and all Subcontractors shall, during the continuance of work under the Contract, including extra work in connection therewith, maintain the following insurance coverages:

(a) Workmen's Compensation, Employers' Liability Insurance, and any insurance required by any Employee Benefit Acts or other statutes applicable where the work is to be performed. All such insurance shall be in amounts sufficient to protect the Contractor and Subcontractors from any liability for bodily injury, sickness or disease (including death resulting at any time therefrom) of any of their employees, including any liability or damage which may arise by virtue of any statute of law in force an which may hereafter be enacted.

(b) Comprehensive General Liability and Property Damage Insurance (including Contractor's protective) in any amounts required by the Owner, but not less than $200,000.00 per person and $500,000.00 per occurrence General Liability and $100,000.00 Property Damage per occurrence, as protection against all risks of damage or destruction of property or bodily injury, sickness or disease (including death resulting at any time therefrom) of persons, wherever located, resulting from any action, omission or operation under the Contract or in connection with the work.

(c) Comprehensive Automobile Liability Insurance, including Property Damage, covering all owned or rented equipment used in connection with the work, in amounts not less than $300,000.00 per person and $500,000.00 per occurrence for bodily injury (including death resulting at any time therefrom) and $100,000.00 per occurrence for property damage.

All insurance policies shall be issued by companies authorized to do business under the laws of the State in which the work will be done. Such policies shall contain appropriate endorsements extending the coverage thereof to include the liability assumed by the Contractor under the Contract. Before work is started, the Contractor shall file with the Owner, Certificates of the insurance coverages required to be maintained by the Contractor, evidencing such insurance and endorsement.

No change or cancellation in insurance shall be made without ten (10) days propr written notice to the Owner; nor shall the Contractor make any change or cancellation in insurance without the Owner's prior written approval thereof.

Compliance by the Contractor with the foregoing requirements as to carrying insurance and furnishing certificates shall not relieve the Contractor of his liabilities and obligations under this Section or under the Sections hereof entitled "Contractor's Responsibility for the Work", and "Contractor's Liability for Bodily Injury, Sickness, Disease and Property Damage", or any other portion of the Contract.

OWNER'S AND CONTRACTOR'S RESPONSIBILITIES FOR FIRE AND EXTENDED COVERAGE INSURANCE HAZARDS:

(a) The Owner shall assume responsibility for maintaining Fire and Extended Coverage Insurance, including vandalism, malicious mischief and where applicable, sprinkler damage, to cover not less than the value of work performed and materials delivered to the site of the project which are to be included in and remain a part of the permanent construction, whether or not installed, except as otherwise provided in paragraph (d) hereof. Contractor shall not be liable for loss or damage to such work or materials caused by fire or other perils hereinbefore enumerated, normally insured policies maintained by the Owner to cover such values shall include (without specifically naming any party other than the Owner in said policies) any interests of Contractor and subcontractors in such work performed and material delivered. The Owner waives any right of recovery he may have against the Contractor, Subcontractors and etc., for damage to or destruction of such work and materials and of other property of the Owner located at the construction location due to fire and extended coverage perils.

(b) Losses, if any, under such insurance shall be payable to the Owner.

(c) Contractor shall be responsible for any and all loss of materials connected with the construction due to unexplainable disappearanee, theft or misappropriation of any kind or nature.

(d) The foregoing provisions shall not operate to relieve the Contractor and Subcontractors of responsibility for any loss or damage to their own or rented property or property of their employees, of whatever kind of nature, or on account of labor performed under the Contract incident to the repair, replacement, salvage or restoration of such items, including, but not limited to

tools, equipment, forms, scaffolding and temporary structures, including their contents, regardless or ownership of such contents except for such contents as are to be included in and remain a part of the permanent construction. The Owner shall in no event be liable for any loss or damage to any of the aforementioned items, or the work connected with the aforementioned items, or any other property of Contractor, Subcontractors or employees, agents or servants of same, which is not to be included in and remain a part of the permanent construction. The Contractor and Subcontractors severally waive any rights of recovery they may have against the Owner and for damage or destruction of their own or rented property, or property of their employees, of whatever kind of nature.

USE OF PREMISES AND MOVING OF MATERIALS:

Before commencing the work, the Contractor shall consult with the Owner as to available space for temporary storage of materials, location of temporary structures, machinery, equipment and other property of the Contractor, and places of access to the work. Locations determined for such storage of materials, temporary structures, apparatus, etc., shall be accepted by the Contractor as temporary, and the Contractor shall, at his own expense, promptly move any part or all of same, at any time or times, as directed by the Owner to avoid interference with, or undue inconvenience to, the work of other Contractors and/or operations of the Owner.

The Contractor shall confine his temporary structures, machinery, equipment and other property of the Contractor, the storage of materials, and the operations of his workmen to limits indicated by law, ordinances, permits, or directions of the Owner or the Owner's Superintendent. Temporary structures shall be neat in appearance, shall not constitute a fire hazard and shall be properly maintained.

The Contractor shall not load, or permit to be loaded, any part of the work with a weight that will damage any work or endanger the safety of the structure or any part thereof.

Automobiles shall not be allowed to park within the perimeter of any building under construction or completed. Trucks and other motor vehicles used in connection with the construction of the project shall not be parked within any building at any time, except as may be necessary on account of construction progress and the operator responsible for the vehicle is present.

PROTECTION OF PREMISES AND PERSONS:

The Contractor shall comply with the "Safety and Engineering Practices" as set forth in the "Manual of Accident Prevention in Construction" as published by the Associated General Contractors of America, and with all applicable State and local safety and sanitary laws, regulations and ordinances, as well as the established safety rules and practices of the Owner.

The Contractor shall not endanger, by cutting, digging, or otherwise, any structures, installations, facilities or work in progress or completed.

The Contractor shall properly protect Owner's and adjoining property from injury and, except as provided under the Section hereof entitled "Owner's and Contractor's Responsibilities for Fire and Extended Coverage Insurance Hazards", shall make good, at his own expense, any damage to same without delay. The Contractor shall exercise particular care to protect all trees which are to remain including roots of same.

The Contractor shall provide and properly maintain warning signs and lights, barricades, railings and other safeguards for the protection of workmen, delivery personnel and others, including the general public, on, about or adjacent to the work as required by the conditions and progress of the work and as may otherwise be directed by the Owner.

Openings within the floors of the working areas shall be temporarily covered or securely railed off, and open areas shall be properly protected from weather. The Contractor shall take every precaution necessary and required in connection with the performance of the Contract to protect equipment and the occupancy and use of the existing premises from damage, dirt, dust, weather, and other conditions detrimental thereto, until completion and acceptance of the work.

TEMPORARY STAIRS, RUNWAYS AND LADDERS:

The Contractor shall provide and maintain temporary stairs, main ladders and runways for access to all areas for the use of all trades.

The Contractor shall provide additional runways and ladders as he may require for the execution of his own work.

All such apparatus, equipment and construction shall meet all requirements for safety and all provisions of laws and ordinances applicable thereto.

Permanent stairs shall be erected as soon as possible, and the Contractor shall provide same with temporary protective treads, handrails and shaft protection.

PLANT PROTECTION:

The Contractor and all Subcontractors and their employees shall be subject to and shall at all times conform to the Owner's rules and regulations for the protection of the plant, materials, equipment, and Owner's employees. Contractor and Subcontractors special badges or cards which will identify them as employees and admit them to such portions of the premises as may be designated by the Owner.

Smoking on the premises will be permitted only in areas where Owner's regulations do not forbid same. Contractors and their employees will be held to be governed by Owner's restrictions and rules with respect to smoking.

GENERAL PROTECTION:

The Contractor shall employ a sufficient number of watchmen for safeguarding the work and premises at all times, outside of regular working hours, until the completed work is turned over to the Owner. Such watchmen shall patrol the entire premises, Contractors' temporary offices and storage buildings at least once an hour. Recording watchmen's clocks shall be used. Persons selected for guard service shall be mature, reliable, trustworthy, physically fit, mentally and morally responsible and capable of exercising good judgement. Intemperate, physically unfit, or otherwise undesirable persons shall not be employed as watchmen.

FIRE PRECAUTIONS:

The Contractor and Subcontractors shall take all necessary precautions to guard against and eliminate all possible fire hazards and to prevent fire damage to any construction work, building materials, equipment, temporary field offices, storage sheds, and all other property, both public and private, complying with all conditions and requirements set forth herein, and shall immediately correct any hazardous conditions resulting from their operations when brought to their attention.

Materials and/or equipment stored in cardboard cartons, wood crates, or other combustible containers, shall be stored in an orderly manner and accessibly located.

The Contractor shall, before starting work, consult with the Owner regarding established plant rules and regulations relative to fire protection requirements and procedures governing any welding and cutting operations and shall strictly conform with such rules and regulations in carrying on his work. No such operations shall be carried on without proper safeguards for fire safety. However, this in no way shall relieve the Contractor of any responsibility for the protection of his own and the Owner's interest.

Employees shall not be allowed to start fires with gasoline or kerosene or other highly flammable materials. No open fires will be permitted. No tar or other melting kettles will be allowed inside or within fifty (50) feet of any building.

The Contractor shall provide the necessary personnel and fire-fighting equipment to effectively control incipient fires resulting from his welding, flame cutting, or other operations involving the use of flame, sparks, or sparkling devices. During such operations all highly combustible or flammable materials shall be removed from the immediate working area, and, if removal is impossible, same shall be protected with an asbestos fire blanket or suitable non-combustible shield against sparks, flames or hot metal.

Not more than one day's supply of flammable liquids, such as oil, gasoline, paint or paint-solvent, or roofing materials, shall be brought into any building at any one time. All flammable liquids having a flash point of 110 degrees F, or below, which must be brought into any building, shall be confined to Underwriters Laboratores' labeled safety cans. The bulk supply of any flammable liquid shall be detached at a sufficiently safe distance from any building and from yard storage of building materials. Spigots on drums containing flammable liquids are prohibited on the project site. Drums are to be equipped with approved vented pumps.

Only a reasonable working supply of flammable building materials shall be located inside of or on the roof of any building.

All tarpaulins used during the course of construction shall be of flame-proof type, secured in place against damage or flapping from wind.

All oil soaked rags, papers and other similar combustible material shall be removed from any building at the close of each day's work, or more often if necessary, and placed in metal containers, with self-closing lids.

Gasoline, benzine or like combustible material shall not be poured into sewers, manholes, or traps, but shall be disposed of, together with all flammable or waste material subject to spontaneous combustion, in a manner to avoid hazard or damage to persons or property.

The Contractor shall obtain permission from the Owner before bringing any of the foregoing material to the site and shall make appropriate arrangements for storing same.

All heating devices in connection with temporary heating facilities shall be of the least hazardous type, shall have all proper safety provisions and shall be installed at such locations and in such manner as will minimize the hazard. Oil-fired stoves, gas-fired heaters and heating units shall be of types approved by Underwriters Laboratories and shall have proper safety combustion controls. Oil-fired heaters shall have integral fuel tanks not to exceed fifteen (15) gallons capacity for each unit, No more than one (1) day's supply of fuel shall be permitted to each heater. No liquid fuels shall be used for starting solid fuel fires. Wood or other debris shall not be burned in coke-fired salamanders.

Temporary heating facilities shall be inspected regularly to assure that they are in safe and proper operating condition at all times. The Contractor shall provide, continuously during operation, properly trained personnel for said inspection.

Smoke pipes and exhausts from boilers, engines, etc., shall in all cases, be extended up and above the roof and adjacent buildings, or as otherwise directed or approved by the Owner.

Contractor's shanties of combustible construction shall not be placed inside of any structure. Such shanties shall be detached at a sufficiently safe distance from any building. Totally incombustible shanties may, if necessary, be located inside of the structure.

Heaters and/or stoves installed in field offices or storage sheds shall have fire-resistant material underneath and at sides, partitions and walls. Pipe sleeves and asbestos covering shall be used where stove pipes run through wall or roof.

FIRE PROTECTION:

The Owner will make available to the Contractor all the necessary fire extinguishers and the existing water supply system for use in connection with the necessary requirements for fire protection as outlined below.

The Contractor shall secure from the Owner and maintain during his construction operations not less than twenty (20) fire extinguishers in good working order, conveniently located about the site of his operations, clearly visible and readily accessible, for proper protection of his work. The Contractor shall also provide and keep filled with water at all times not less than ten (10) 5-gallon open head water barrels properly distributed throughout the areas of his operations for adequate fire protection. A round bottom pail shall be hung at each barrel, shall be identified by color and shall be clearly marked "FOR FIRE ONLY".

Each fire extinguisher and water barrel location shall be conspicuously identified.

Fire extinguishers and water barrels are to be provided for adequate fire protection during the time and in the locations where thereare concentrated combustible materials, including but not limited to crates, wrappings and other packing materials, from lumber stored, being placed or in place or being removed and scrap or rubbish

It shall be the responsibility of the Contractor to increase the number of water barrels and fire extinguishers and adjust the distribution of these items, without additional cost to the Owner, to provide adequate fire protection at all times and in the event the Owner may deem the provisions and distribution by the Contractor to be inadequate for the hazards and have so advised the Contractor.

The Contractor shall consult with the Owner, determine locations of existing fire hose and equipment and be responsible for procedure to enable access to and the use of such facilities in the event of fire.

This Contractor and his Subcontractors shall provide at their own expense and maintain fire extinguishers in their temporary structures.

The fire extinguishers available from the Owner are equivalent to the 2-1/2 gallon acid and soda type suitable for the hazards to be encountered. However, in areas of flammable liquid, asphalt or electrical hazards the Contractor shall provide and maintain extinguishers equivalent to the carbon dioxide type or dry chemical type. During freezing weather, extinguishers shall be enclosed in heated cabinets.

During the period of rerouting the underground services when any section of the adjacent underground water line may be deactivated additional arrangements and apparatus shall be provided in order to assure adequate protection during this period of deactivation.

EXPLOSIVES

The Contractor shall obtain the permission of the Owner before using dynamite or other explosives on the property of the Owner and shall be governed by the established safety rules and practices of the Owner and applicable regulations of governing authorities in their use and storage.

The Contractor shall maintain an accurate record of the dates, times and locations of blasting, as well as of the amount of each charge, and at the end of each day's blasting shall submit a signed copy of such record to the Owner.

CLEANING OF PREMISES:

The Contractor, and the Owner when performing any work with his own forces, shall not allow to accumulate and shall each remove, at his own expense, from the premises and the site, at least once each week, his surplus and scrap material, bulk waste and debris, such as empty crates, cartons and containers, resulting from his work, his employees and his Subcontractors. All such materials, waste and debris which are combustible shall be removed from buildings at the end of each working day.

Without limiting the responsibility of each Contractor and the Owner, as hereinbefore provided, the General Contractor shall, at his own expense:

(a) Maintain the site, the premises and all of the work in an orderly and clean condition at all times.

(b) Keep all floors, road, sidewalks, pavements and parking areas free, at all times, from accumulation of dirt, rubbish and general refuse, water and snow and ice.

(c) Keep all roof areas clean, at all times, and free from accumulation of dirt, rubbish and general refuse.

(d) Broom clean the dirt, rubbish and general refuse from the floors on the interior of the buildings when necessary and practicable, or when so directed by the Owner, and take all precautions to avoid dust and interference with the Owner's operations.

All Contractors, and the Owner, shall cooperate and each shall use reasonable diligence and shall make every effort, in connection with their work, to avoid excessive dirt, rubbish and general refuse and to minimize the extent of cleaning and removal thereof required hereunder of the Contractor.

Contractors shall keep their materials in proper storage arrangement at all times; otherwise the Owner when cleaning the building interior or the premises as required herein, may remove scattered material as rubbish or general refuse.

In event any Contractor fails to comply with the requirements herein, the Owner, after notice to the said Contractor, shall have the right to order the cleaning and/or removal done by others, and said Contractor agrees to reimburse the Owner, for the cost incurred in connection therewith.

Without relieving the Contractors not under the jurisdiction of General Contractor from any of their respective obligations hereunder, they may if they so desire, make their own arrangements for cooperative effort in keeping the premises clean and in the removal of surplus and scrap material, bulk waste and rubbish as in their interests required.

Each Contractor shall remove from the premises and site all his tools, scaffolding, surplus materials and all temporary work and structures upon completion of the work and shall leave the work and the premises clean and acceptable to the Owner.

TELEPHONE:

The Contractor shall provide telephone service for his own use.

SIGNS, ETC:

No signs, billboards, posters, or any type of advertising matter will be permitted on, about or adjacent to the premises, or on any structure on the premises, except by written permission from the Owner; and then only with the approval of same as to location, size, text, design and other features. The Contractor shall maintain same, as approved, in neat and orderly appearance, painted, and in good repair.

DELAYS AND EXTENSION OF TIME:

Should the progress or completion of the several portions or the whole of the work be delayed as a result of fire, flood, cyclone, tornado or other similar casulaty, war, insurrection, riot or civil commotion or because of any governmental act or regulation, all beyond the control of the Contractor, or should the Contractor be delayed in the prosecution of the work through the fault of any other Contractor employed by the Owner, or because of the Owner at the time of completion of such portion or portions or the work directly affected by such delay shall be extended for a period equivalent to the time lost, which period shall be determined by the Owner.

No extension of time shall be granted on account of delays caused by weather, except as set forth above.

No extension of time shall be granted unless the Contractor, within forty-eight (48) hours of the occurrence of the cause of the delay, notifies the Owner and the notification shall be in writing, that such cause has occurred and makes written application for the specific extension of time claimed to be necessitated by reason of such cause.

The time for completion of the work established in the Contract is predicated on the work of other Contractors which may be employed by the Owner being performed concurrently with the work of the Contractor and the Contractor will not be entitled to an extension of time because of necessary interruptions to or suspension of his work to enable the other Contractors to perform their work.

The Contractor shall have no claim against the Owner for an increase in the Contract price or a payment or allowance of any kind, based on damage, loss or additional expense the Contractor may suffer as a result of any delays in prosecuting or completing the work under the Contract, whether such delays are caused by casualty, disturbance, or governmental act or regulation, set forth in the first paragraph hereof, or by any other circumstance. The Contractor shall assume all risks of delays in prosecuting or completing the work under the Contract, and his only remedy concerning delays shall be an extension of time under the conditions and for the causes set forth in the first paragraph hereof.

SUSPENSION OF OPERATIONS:

The Contractor shall, upon receipt of the Owner's written notice and within the time stated therin, suspend shipment and delivery of material and stop all work and operations hereunder for such period or periods of time as the Owner may deem advisable and designate in said notice. Upon receipt of such notice, the Contractor shall immediately confer with the Owner relative to the probable duration of such suspension and stoppage, delays and extensions of time resulting therefrom, the reduction and possible elimination of the Contractor's field costs, and with respect to such other prospective costs and expense as may result directly from such work stoppage.

Upon further written notice from the Owner, the Contractor shall promptly resume all of any part of the work required by said resumption notice.

Reimbursement to the Contractor shall be limited to his actual net costs and expenses (without other overhead or profit) for such items as shall have been agreed upon between the Owner and Contractor and the Contractor shall have no further claim against the Owner for damage or loss resulting from such suspension of operations. Such costs and expenses shall be subject to audit by the Owner.

CONTRACTOR'S DEFAULT:

Should the Contractor, at any time, (1) become insolvent, or (2) if an individual becomes deceased or (3) fail to remedy imperfections in the work or (4) fail to supply a sufficient number of skilled workmen or sufficient materials or equipment of proper quality or kind, or (5) fail in any respect to prosecute the work with promptness and diligence, or (6) fail in the performance of any agreements contained in the Contract, then the Owner shall have the right, by written notice to the Contractor, to terminate the employment of the Contractor; provided that, with respect to any one or more of the defaults hereinbefore enumerated in Items (3) through (5), the Owner shall have first certified as to such default and the Contractor shall not have remedied the default so certified within ten (10) days after receipt of Owner's notice to the Contractor of his intent to terminate the employment of the Contractor, or shall not have satisfied the Owner, within three (3) days after receipt of such notice of intent, that the default so certified will be promptly remedied.

With respect to the Contractor's defaults enumerated in Items 3 and 4 above, in lieu of terminating the employment of the Contractor and subject to the same conditions of certification and notice of intent hereinbefore described, but without further notice to the Contractor, the Owner may elect to make good such deficiencies and deduct the cost thereof from any sums then due or thereafter to become due to the Contractor, which cost shall be certified by the Owner and the Contractor shall have no claim against the Owner, for damage or loss in connection therewith.

Written notice of termination of employment of the Contractor, as hereinbefore provided, shall be delivered to the Contractor's Superintendent, or sent to the Contractor, at least five (5) days prior to the effective date of termination specified in said notice. On the effective date of such termination, the Owner shall be at liberty to enter upon the premises, to take possession of all materials, supplies, tools, facilities and equipment thereon, to use same as may be necessary for the completion of the work, and to employ, upon such basis as the Owner may deem advisable, any person or persons to complete the work called for under the Contract.

In case of such discontinuance of the employment of the Contractor, the Contractor shall not be entitled to receive any further payment under the Contract until the work required to be performed thereunder shall be finished, at which time, if the unpaid balance of the amount to be paid under the Contract shall exceed the expense incurred by the Owner in finishing the work, such excess shall be paid by the Owner to the Contractor; but, if such expense shall exceed the unpaid balance, the Contractor shall pay the difference to the Owner.

The Owner shall keep an accurate account of all such expenses incurred, which account shall be subject to audit by the Contractor. The expenses incurred by the Owner, as herein provided, shall include the cost to the Owner for furnishing workmen or materials or for finishing the work, including reasonable charges and costs resulting from such default, as well as any damage or loss suffered by the Owner because of such default.

The remedies provided the Owner in this section are in addition to and not in lieu of any and all remedies provided by law for breach of Contract.

TERMINATION BY OWNER:

The Owner, at his discretion, may terminate the Contract at any time by the giving of written notice to the Contractor's Superintendent or the sending of notice to the Contractor at least five (5) days prior to the effective date of termination specified in such notice. After receipt of notice of termination specified in such notice. After receipt of notice of termination, the Contractor shall terminate all work under the Contract on the date specified in such notice and shall (1) terminate allorders and Subcontracts chargeable to the performance of the Contract, which may be terminated without costs; (2) terminate and settle, subject to approval of the Owner, other orders and Subcontracts where the cost of settlement will be less than costs which would be incurred were such orders and subcontracts to be completed; and (3) transfer to the Owner, in accordance with Owner's directions, all materials, supplies, work in process, facilities, equipment, machinery or tools acquired by the Contractor in connection with the performance of the work and for which the Contractor is to be reimbursed hereunder, and all drawings, working drawings, sketches, specifications and information accumulated for use in the performance of the work. The Contractor shall, if directed by the Owner and to the extent stated in the Notice of termination, do such work as may be necessary to preserve the work in progress and to protect material, plant and equipment on the work or in transit thereto.

Upon termination of the Contract and compliance by the Contractor, all in accordance with the provisions of the preceding paragraph, the Owner shall pay the Contractor in discharge of all his obligations under the Contract, only for (2) such portion of the work as the Contractor and his Subcontractors shall have completed, plus (b) the cost to the Contractor of materials which have been delivered to the plant site of the Owner up to the effective date of termination, plus (c) the cost to the Contractor of materials to be used in performance of the Contract for which bona fide, irrevocable orders have been placed by the Contractor prior to the effective date of termination which have not been terminated and settled hereunder, provided that such materials are delivered to the Owner within a reasonable period after the effective date of termination, plus (d) the cost to the Contractor of terminating and settling orders and Subcontracts in accordance with this provision, and plus (e) the cost to the Contractor of complying with the Owners directions relative to the preservation of the work in progress and the protection of materials, plant and equipment on the work or in transit thereto; the Owner shall have a credit against the aggregate of items (2) through (e) for the amounts thereto fore paid by the Owner to or for the account of the Contractor, pursuant to other provisions of the Contract. The payment to be made for any such completed portion of the work shall be in the proportion that the completed portion of the work bears to the entire work provided for in the Contract, which portion shall be determined by the Owner. "Cost to the Contractor" as used herein shall include field and home office expense directly applicable to the Contract and not otherwise reimbursed hereunder; however, the Owner shall be under no obligation to pay the Contractor for anticipated profit on any portion of the work not complete. Such costs and expenses shall be subject to audit by the Owner. The sum of all amounts payable under

this Section plus the sum of all amounts previously paid under the Contract shall in no event exceed the total Contract sum. Payment hereunder shall be subject to the provisions of the Section hereof entitled "Liens", and all other relevant provisions of the Contract.

The only claim of the Contractor against the Owner for loss, damage or otherwise, on account of such termination by the Owner, shall be for compensation and payment in accordance with the above provisions.

The Owner shall be under no obligation to compensate the Contractor under the provisions of this section if the Contract is terminated because of default or breach of contract by the Contractor, under the Section hereof entitled "Contractor's Default".

OWNER'S ACCESS AND PARTIAL OCCUPANCY:

The Owner and his representatives shall have access to the work at all times. The Owner, at his election, may from time to time occupy any of the units or parts of the project as the work in connectiontherewith is completed to such a degree as will, in the opinion of the Owner, permit of their temporary or permanent use. The Owner will within a reasonable time prior to any such partial occupancy, give written notice to the Contractor or the Contractor's Superintendent thereof and such occupancy shall be upon the following terms:

(a) The guarantee periods shall not begin to run until completion of the work under the Contract.

(b) Such occupancy shall not constitute an acceptance of the work or any portion thereof nor shall such occupancy relieve the Contractor of liability to perform any work required by the Contract but not completed at the time of occupancy.

(c) The Contractor shall not be responsible for wear and tear or damage resulting from such partial occupancy.

(d) The Contractor shall, if ordered by the Owner in writing, provide additional material and equipment and/or furnish added heat, light, water or other services (including Maintenance) as stated in the written order, and the Owner shall make proper remuneration thereof to the Contractor.

INSTALLATION OF OWNER'S EQUIPMENT AND MACHINERY:

The Contractor agrees that the Owner shall have the right, after seven (7) days, written notice to the Contractor or the Contractor's Superintendent, to place and install as much equipment and machinery during the progress of the work as is possible before the completion of the various parts of the work; and further agrees that such placing and installation of equipment shall not in any way evidence the completion of the work or any portion thereof, nor signify the Owner's acceptance of the work or any portion thereof.

Should the Owner place or install such equipment and machinery with his own forces, then he shall be responsible for any damage to work of the Contractor caused by the Owner's work or workmen. Should the Owner have such placement or installation performed by another Contractor, then the Owner shall require said Contractor to be responsible for all such damage caused by his work, his workmen or his Subcontractors.

NOTICES:

Whenever, under the Contract, any notice or notification is required or authorized to be given in writing, such notice or notification shall for all purposes be deemed to be duly given and received if sent by United States registered mail addressed to the Owner, Contractor, etc., as the case may be, as follows:

To the Owner, directed to the attention of the person having signed the Agreement on its behalf, or an officer of the Owner, at the address of the Owner stated therein.

To the Contractor, directed to the attention of the person having signed the Agreement on its behalf, or an officer of the Contracting Organization, at the address of the Contractor stated therein.

Should the Owner or the Contractor change his address, notice of such change in address, by any one of them, shall be given to each of the others in the manner hereinbefore provided and such new address shall be deemed the proper address to which any subsequent notice or notification may be mailed.

SPECIAL CONDITIONS

GENERAL NOTE

The Special Conditions are part of the Contract Documents and shall apply to all work under this Contract, even to the extent of taking precedence over conflicting provisions of the General Conditions.

LIABILITY INSURANCE

The following shall be substituted for paragraphs (b) and (c) under Liability Insurance in the General Conditions.

(b) Compreshensive General Liability and Property Damage Insurance (including Contractor's protective) in any amounts required by the Owner, but not less than $200,000 per person and $1,000,000 per occurrence General Liability and $500,000 Property Damage per occurrence, as protection against all risks of damage or destruction of property or bodily injury, sickness or disease (including death resulting at any time therefrom) of persons, wherever located, resulting from any action, omission or operation under the Contract or in connection with the work.

(c) Comprehensive Automobile Liability Insurance, including Property Damage, covering all owned or rented equipment used in connection with the work, in amounts not less than $300,000 per person and $1,000,000 per occurrence for bodily injury (including death resulting at any time therefrom) and $100,000.00 per occurrence for property damage.

GUARANTEE

The following shall be substituted for the second paragraph under Guarantee in the General Conditions.

The Guarantee period shall be for one (1) year unless a different period of time is expressly stated under any trade section of the Specification, in which case the Contractor's Guarantee shall, with respect to such trade or trades, be for the longer or shorter period so stated.

DIVISION 2 - GENERAL CONTRACT WORK

SECTION 2.1 - EXCAVATION AND BACKFILLING

GENERAL REQUIREMENTS

The Contractor shall furnish all labor, materials, equipment, tools, transportation, supervision and services required for performing all work as shown or indicated on the Drawings and as called for under this Specification and including all incidental items to effect a finished and complete job even though such items are not shown or particularly mentioned herein.

All material prior to incorporation into the site shall be located, placed and stored in accordance with the Owner's directions.

The Contractor prior to submitting his bid, shall inspect the site and familiarize himself with the existing conditions.

The Contractor shall submit to the Owner on request, affidavits certifying material compliance with the Specifications. The expense of sampling, packaging and testing shall be at no additional expense to the Owner.

PROTECTION

The Contractor shall provide all necessary barricades, lights and safeguards to protect the public and workmen employed at the site. This shall be done in accordance with all code requirements. He shall also protect all curbs, pavements, telephone and power lines and all underground utilities from damage and shall be responsible for damage done during the progress of the construction caused thereby. Where excavation is required around existing utilities, they shall be supported so as not to interrupt their service.

LAYOUT OF THE WORK

The Contractor shall layout his own work based upon control points shown on the Drawings and shall be held responsible for the accuracy of all lines and elevations of the proposed work.

WATER CONTROL

Control grading around excavation so that ground is patched to prevent water from running into the excavated areas or damaging

the structures. Maintain all pits and trenches where concrete is to be placed free of water at all times. Provide all pumping required to keep excavated spaces clear of water during construction.

BRACING AND SHEETING

The Contractor shall furnish, put in place and maintain such sheeting, bracing and shoring as may be required to properly support the sides of any excavation and to prevent any movement of earth which could in any way injure the work under construction. If the Engineer is of the opinion that at any point sufficient or proper supports have not been provided, he may order additional supports at the expense of the Contractor, but neither the placing of such additional supports by the order of the Engineer, nor the failure of the Engineer to order such additional supports placed, shall release the Contractor from his responsibility for the sufficiency of sheeting and bracing and the requirements under the heading "Protection". Special care shall be taken to prevent any caving of the sides of excavation and injury to the personnel, completed work, or to adjacent property.

REQUIREMENTS FOR FILLING AND GRADING

All select fill, shall be furnished by the Contractor and shall conform to the material description of this Specification and shall be compacted in accordance with the requirements called for under the heading "Controlled Density Compaction". Compaction tests shall be performed as instructed in this Specification.

FILL MATERIAL

The fill material shall conform to the requirements for sand-gravel material, Section 7.02.10 of the Michigan State Highway Department's Standard Specifications for Road and Bridge Construction.

CONTROLLED DENSITY COMPACTION

At the time of compaction, both the subgrade and the fill material shall be free of frost or frozen lumps of earth. All material shall be at optimum moisture content and shall be compacted in 6" layers to not less than 95 percent maximum density as determined by AASHO T-180 - Modified Proctor Test.

Controlled quantities of water may be added to the fill if required to attain optimum moisture content for maximum density. Compaction of fill by flooding will not be permitted.

COMPACTION TESTS

The Owner may engage an independent testing laboratory to perform soil compaction tests on compacted fill areas. Tests will be performed during the period when compacted fill is being placed and the Contractor will be required to conform to the requirements of the testing laboratory for compaction and moisture content control, as determined by these soil tests.

SECTION 2.2 - CONCRETE

STORING OF MATERIALS

All material prior to incorporation into the site shall be located, placed and stored at the direction of the Owner.

FORMS AND CENTERING

The Contractor shall adequately design forms for the pressures to be expected. Forms shall conform to the shape, lines and dimensions shown on the Drawings and together with centering be true, rigid and properly braced so minimum deflection or bulging occurs when filled with wet concrete and sufficiently tight to prevent leakage of wet concrete.

FORM SPREADERS

Use metal form spreaders and ties so arranged that when forms are removed, no metal shall be within 1" of any surface. Close openings left by rods or bolts. Use wire ties only in light work. Do not use on surfaces where discoloration will be objectionable.

INSTALLATION AND REMOVAL

Do not place concrete in any form until bracing of same is entirely completed and centered for the course or section to be poured, and until all reinforcing is in place. Remove dirt and debris from forms.

Forms shall not be disturbed until the concrete has adequately hardened. Shoring shall not be removed until the member being supported has acquired sufficient strength to support safely its weight and the load on it. The Contractor shall be held fully responsible for any damage to the concrete which might occur due to the early removal of forms or bracing. All such damage shall be repaired by him at his own expense, to the satisfaction of the Owner.

Properly wet, oil or otherwise treat form surface to prevent bonding of concrete to the forms. Soak the soil surfaces with water which will be in contact with concrete.

REINFORCING

Reinforcing bars shall be of Grade 40 billet steel conforming to the requirements of the Standard Specifications for Deformed Billet - Steel Bars for Concrete Reinforcement, ASTM Designation: A615-68.

Furnish bar supports, chairs, spacers, spotters, etc., of suitable types adequate to avoid displacement of reinforcement during construction.

PLACING

Erect reinforcement in accordance with "Building Code Requirements for Reinforced Concrete", (ACI 318-63) and in accordance with approved shop drawings.

Securely hold reinforcing in place by ties, chairs, or such other means as may be necessary to prevent displacement during concrete placing.

Bars and accessories are to be free from loose flaky rust, scale, grease, clay and other coatings or foreign substance which may impair their bond with the concrete. All such material is to be removed from the bars to the satisfaction of the Engineer.

SHOP DRAWINGS

Submit shop drawings to the Engineer showing dimensions, bar schedule and bending details for approval.

CONCRETE MATERIALS

Portland cement complying with ASTM Specification C-150, Type 1, latest edition.

Concrete aggregate shall conform to the Standard Specifications for Road and Bridge Construction of the Michigan Department of State Highways, latest edition. Coarse aggregate shall meet the physical requirements of Class 6AA except work to be entirely covered up may use Class 6A. The grading requirement shall conform to Class 6A except the maximum size of aggregate shall be reduced if necessary to meet the requirement of not exceeding 1/5 of the thinnest section of pour for walls and footings. Fine aggregate shall be Natural Sand, 2NS. A certified representative sample of proposed coarse and fine aggregates shall be tested for grading, soundness and deleterious substances by a qualified

laboratory. The laboratory shall submit a written report on the test to the Engineer for approval. This test shall be made at the Contractor's expense as part of the cost of this work.

CONCRETE DESIGN

All concrete mixes shall be designed by a qualified laboratory using actual representative samples of proposed aggregates and cement to conform to the following properties:

(1) Concrete shall have a 28-day compressive strength of 3000 psi.

(2) Minimum cement content shall be 5½ bags/ cu yd.

(3) Maximum slump shall be 4" and minimum slump shall be 2".

The designing laboratory shall submit its design in a written report to the Engineer for approval. The report shall state the mix proportions used and the slump and compressive strength of concrete as determined by laboratory tests. All costs of laboratory mix design shall be paid for by the Contractor as part of the cost of his work.

No admixture shall be used without the specific approval of the Engineer.

TESTS OF CONCRETE

During the progress of the work, compression test specimens shall be made by qualified testing laboratory personnel and cured in accordance with "Standard Method of Making and Curing Concrete Compression and Flexure Test Specimens in the Field" (ASTM Designation C-31). Two specimens shall be made for each test. One test shall be made for each day's pour. Specimens shall be cured under laboratory conditions except that when in the opinion of the Engineer there is a possibility of the surrounding air temperature falling below 40 F, he may require additional specimens to be cured under job conditions.

Specimens shall be tested in accordance with the "Standard Method of Test for Compressive Strength of Molded Concrete Cylinders" (ASTM Designation C-39).

Reports shall be submitted to the Engineer and to the Owner for 7 and 28 days cylinders of each concrete test. All costs incurred by such tests shall be paid by the Contractor.

PLACING OF CONCRETE

Ready-mix concrete shall conform to the requirements of ASTM Designation C-94.

All concrete shall be thoroughly compacted by vibration or other suitable means during placing and shall be thoroughly worked around reinforcement and embedded fixtures and into the corners of the forms.

Care shall be taken not to overvibrate to the point that segregation results. Avoid displacing steel reinforcement and contact between the vibrator and the face of the forms. Separation of coarse aggregates shall be avoided by the use of pouring baffles at the tops of forms and ends of chutes. Deep narrow wall forms shall be provided with outside drop chutes and pockets so that flow of concrete can take place without separation. Free vertical drops shall be limited to 5'. Concrete shall not be moved horizontally by the use of a vibrator.

Concrete shall not be placed on ice, snow, soft or frozen foundation material or in water.

The Contractor shall be responsible for all concrete damaged by low temperatures and any concrete so damaged shall be removed and replaced by him, at no additional cost to the Owner. Adequate equipment shall be provided for heating concrete materials and protecting the concrete during freezing weather. No frozen materials and all reinforcement, forms, fillers and ground with which the concrete is to come in contact shall be free from frost. Whenever the temperature of the surrounding air is below 40 F, all concrete placed in the forms shall have a temperature of between 50 F and 80 F, and adequate means shall be provided for maintaining a temperature of not less than 70 F for three days or 50 F for five days, or for as much more as is necessary to insure proper curing of the concrete. Temperature attained using temporary heat shall not exceed 80 F.

CURING OF CONCRETE

Provision shall be made for maintaining concrete in a moist condition for at least 7 days after the placement of the concrete by covering with burlap, kraft paper, wet sand or sprayed membrane.

CLEANUP AND PROTECTION

Where concrete, joint materials, or other materials used under this section are spilled on adjacent work, such materials shall be completely removed so that the affected surface will be free from discoloration or other damage.

Tools, materials, equipment and debris incidental to the work under this section shall be promptly removed from the site as soon as the work is completed.

Provide protection to all adjacent work (including other trades) from damage; and assume responsibility, and pay for the replacement of all damage caused by the operations of this work.

SECTION 2.3 - METAL BUILDING

GENERAL REQUIREMENTS

The Contractor shall furnish and install one metal building where shown on the Drawings to house the wet well pumps.

The building shall be complete in every respect and shall include material for the fabrication of steel buildings so designed and constructed as to be weathertight, with all necessary wind bracing, roofing, siding, insulation, anchor bolts, doors, windows, hardware, fasteners and sealant.

The building shall be the design of a manufacturer regularly engaged in the fabrication of pre-engineered structures conforming as specified hereafter to the Metal Building Manufacturers Association Standards.

The building shall be self-framing gable roof type. The vertical live load in addition to the applicable dead loads shall be not less than 40 psf applied on the horizontal projection of the roof structure. The wind load shall be 20 psf proportioned and applied as horizontal and uplift forces as prescribed by Metal Building Manufacturers Association "Recommended Design Practices Manual" of current issue. All other applicable superimposed dynamic and/or static loads shall be considered as part of the design requirements and combined with the normal design loads. The combining of normal loads and auxiliary loads for design purposes shall be as prescribed by the Metal Building Manufacturers Association "Recommended Design Practicss Manual" of current issue.

Exterior walls shall be similar to Armco Sculptured Steelox Panels and the roofs shall be similar to Armco Steelox Roof Panels. Both roof and wall panels to be not less than 20 gage galvanized steel.

Provide 2½" of fiberglass insulation with vinyl cover on all interior wall panels and roof panels. Cover insulation on interior walls with 28 gage corrugated sheet metal.

Provide flush metal 1-3/4" doors as shown on the Drawings. Door leaves shall be flush type formed from not less than 20 gage steel. The door leaf shall be reinforced, stiffened, and sound deadened. The top of each door shall be closed and made watertight. The doors shall be mortized for hardware, and shall be complete with ball bearing hinges, full mortise type, 1-1/2 pair, non-removable pin. The doors shall be weather stripped and have an extruded aluminum threshold.

The inactive door of the set of double doors shall have a chain bolt and a foot bolt. The active door shall have mortised cylinder type lock sets, with latch bolt action by knob from either side, and dead bolt by key from outside and by turn knob from inside.

Door frames shall be double rabbited type, formed from 16 gage galvanized steel. Mortise and reinforce for hardware, and provide rubber bumpers in the strike jamb.

Provide all interior eave trim, ceiling cove, girt covers, and trim around door frames. Provide eave and rake trim, wall cap, facia, flashings, gutters and downspouts.

Metal building shall be equal to Armco Model S-2.

DIVISION 15 - MECHANICAL WORK

SECTION 15.1 - BASIC MATERIALS AND METHODS

GENERAL REQUIREMENTS

The Contractor shall furnish all labor, materials, equipment, tools, transportation, supervision and services required for performing all work as shown or indicated on the Drawings and as called for under this Specification and including all incidental items to effect a finished and complete job even though such items are not shown or particularly mentioned herein.

WORK VERIFICATION

The Contractor shall assume all responsibility to have, thoroughly examined the Drawings and Specifications including all Addenda, verified all conditions of the work, inspected the site and other existing facilities and conditions, taken all field measurements of related and connecting work, and to have determined the entire scope of the work required for a finished and completed project, in accordance with the Drawings and Specifications and as approved by the Engineer.

CODES, PERMITS AND INSPECTIONS

Work shall be executed and inspected in accordance with all local, county and state rules, Michigan Department of Health, Insurance Underwriters, and regulations of the local utilities that may govern this class of work. All fees in connection therewith shall be paid by the Contractor.

The Contractor shall furnish to the Owner a certificate of final inspection and approval from the inspection authorities having jurisdiction.

SPECIFICATIONS AND DRAWINGS

The Drawings accompanying these Specifications are diagrammatic and are intended to convey the scope of the work, general design, and arrangement of the various systems. All lines shall be run as required to complete the work. The Drawings are not intended to be scaled for rough-in work, nor to serve as shop drawings.

WORKMANSHIP AND MATERIALS

All labor shall be performed by competent workmen, skilled in their particular branches of the trade. Standard accepted paractices in various trades shall be considered as a minimum requirement.

All materials shall be new and the best of their respective kinds, and shall conform to all standards or requirements governing same.

Material and equipment shall be installed in a neat and workmanlike manner. Adjacent units shall be leveled, spaced and aligned in such a manner as to effect a suitable appearance and allow for satisfactory operation, disconnection and reconnection, access adjustment and maintenance.

PROTECTION OF EQUIPMENT

The Contractor shall protect all equipment and material intended for installation, all fully completed and partially completed work, and all apparatus and tools against theft, loss or damage from any cause until Owner's acceptance. Adequate storage facilities shall be provided for material and equipment used during construction. Equipment and work shall be protected from dirt, water, chemicals, paint, foreign material, weather and atmospheric conditions until final acceptance. Special covers, tarpaulins, enclosures or other protection shall be provided as required. Open ends of piping, equipment and apparatus shall be sealed with temporary covers, caps or plugs to prevent entry of dirt and foreign material during construction.

OPERATION OF SYSTEMS

To obtain Owner acceptance, the Contractor must demonstrate in the presence of the Engineer that the completely installed and tested systems are complete, comply with the Drawings and Specifications and function properly under actual operating conditions.

COORDINATION

When simplified or improved construction appears possible by the relocation or alteration of certain equipment or arrangements, proposals for changes will be considered by the Engineer. The Contractor shall submit details of the proposed changes in writing for approval before proceeding with the work.

The Contractor shall consult the Engineer concerning interferences. The Engineer will decide upon the final locations and arrangements.

DIMENSIONS

The Contractor shall field locate mechanical equipment not dimensioned on the Drawings. Dimensions shall not be scaled from the Drawings. The Engineer shall be notified concerning any discrepancies between actual measurements and those shown on the Drawings which would prevent good practice, good arrangement, or which are contrary to the intent of the Drawings and Specifications, before proceeding with the work.

CUTTING, PATCHING AND DAMAGE

The Contractor shall avoid cutting and patching as far as possible; however, any unavoidable cutting and patching required to install mechanical equipment shall be performed by workmen skilled in the type of work involved. Cutting and patching shall be approved by the Engineer.

OPERATING INSTRUCTIONS

Before Owner's acceptance of the work, the Contractor shall provide detailed verbal instructions to Owner's operating personnel regarding the installed systems. In addition, the Contractor shall furnish the services of qualified factory representatives for all major equipment to start the equipment and carefully instruct Owner's personnel concerning its operation.

The Contractor shall furnish to the Owner complete instruction manuals, maintenance information, wiring diagrams, parts lists, control charts and manufacturer's literature on all equipment and systems. Catalogs, sales literature and shop drawings will not be acceptable.

ARRANGEMENT OF EQUIPMENT

The Contractor shall arrange overhead mechanical equipment and piping to provide maximum headroom. All piping and equipment shall be installed neatly and compactly. If clearances around equipment appear to be inadequate, the Engineer shall be notified before proceeding with the installation.

The Contractor shall make careful provisions to facilitate future servicing and removal of all equipment.

REINFORCING

The Contractor shall furnish and install all necessary supplemental structural materials required to adequately distribute the loads and reinforce the building where equipment and piping is supported. The Contractor shall be made responsible for any damage to work or existing equipment caused by inadequate supports and reinforcing.

Building structural members shall not be cut to install equipment without the permission of the Engineer.

ARRANGEMENT OF PIPING

Unless specifically shown otherwise on the Drawings, the Contractor shall install all piping parallel with the walls of the building and level, except for pitch to permit drainage. The Contractor shall arrange all piping and equipment neatly and compactly. In general, overhead piping shall be kept as high as possible and vertical piping as near to walls or columns as possible. The Contractor shall avoid obstructing access spaces and passageways. The Contractor shall arrange piping and provide clearances to facilitate normal operation and future servicing of the piping, equipment and systems. All offsets and changes in direction shall be made by use of standard manufactured fittings unless otherwise noted on the Drawings or approved by the Engineer.

The piping required is shown on the Drawings by means of diagrams, schematics and piping layouts. It is the Contractor's responsibility to determine exact routings and dimensions.

The Contractor shall field check and verify all dimensions locating existing structure, equipment, clearances and piping systems as required to connect to existing systems.

The Contractor shall provide all necessary offsets and additional fittings, whether or not shown on the Drawings, to meet the requirements and to coordinate the piping systems with the building.

The Contractor shall locate valves so as to be accessible and in convenient operating positions.

The Contractor shall lay underground piping on only solid undisturbed ground. When crossing another trench or excavation adjacent to building wall or foundation, piping shall be supported on approved foundations or concrete or brick piers or cradles as directed. Bottoms of trenches shall be tamped hard, graded to secure required pitch, and shaped to give substantial uniform support to lower third of full length of pipe, with minimum recesses excavated for bells and joints.

The Contractor shall support and protect underground piping so that it remains in place without settling and without damage during and after backfilling. The Contractor shall replace any piping that is damaged by settling.

HANGERS AND SUPPORTS

The Contractor shall provide hangers to adequately support the piping systems. The Contractor shall install hangers which permit convenient vertical adjustment to maintain pitch required for proper drainage and allow for and carry all loads resulting, the weight, as well as the expansion and contraction of piping. Hangers must support piping independently of connected equipment.

Maximum hanger spacing and minimum solid steel rod diameters for the support of horizontal steel piping shall be as follows:

Pipe Size	Rod Diameter	Maximum Spacing*
Up to 1-1/4"	3/8"	8'
1-1/2" and 2"	3/8"	10'
2-1/2"	1/2"	12'
4" and 5"	5/8"	15'
6"	3/4"	17'
8" to 12"	7/8"	20'

* Except at changes of direction of piping, where a hanger not farther than 18" from the change of direction is required.

Hangers shall be supported directly from suitable building structural framing members when good arrangement permits. Additional adequate intermediate steel members shall be furnished, as required, to provide approved structural support for the hangers.

For steel pipe sizes 2" and smaller, use split ring type hangers with turnbuckle adjusters, Grinnell Figure 115.

For steel pipe sizes 2-1/2" and larger, use adjustable wrought clevis type hangers, Grinnell Figure 260.

For heavy vertical steel pipe passing through the second floor levels, use riser clamps, Grinnell Figure 261.

STRUCTURAL ATTACHMENTS

When attaching to structural steel building framing members, use welded beam attachments or malleable beam clamps, Grinnell Figure 66 or Grinnell beam clamps of the type recommended for the piping, load and the type of beam. Use no "C" clamps.

Use threaded steel rods of sizes as scheduled above to connect the structural attachments to the hangers. Rods shall have sufficient threaded length to permit adjustment of hangers to correctly pitch the piping. Use no chain, wire, perforated strap, rope or wood to support piping.

SLEEVES

The Contractor shall provide sleeves large enough to accommodate pipe and its covering. Inside diameter shall be at least 1" greater than the pipe or insulation outer diameter, and passing entirely through floor, ceiling, wall or partition. Pack sleeves through fire walls or slabs in accordance with Underwriters' requirements. Finish flush with construction except as otherwise noted.

Provide cast iron or steel pipe sleeves for pipes passing through exterior walls, footings, or beams. Make pipe watertight in sleeve, by sealing with "Link-Seal" as manufactured by the Thunderline Corp., or Engineer approved equal.

Except as otherwise noted, provide No. 22 USSG galvanized steel sleeves for pipes passing through interior floors, ceilings, walls or partitions.

WELDING

Mill or machine bevel piping before being welded. Bevel shall be 35 to 40 degrees. On odd lengths of steel pipe, beveling may be accomplished by means of cutting torch, provided scale and oxide are removed with hammer, chisel or file.

Weld metal shall be thoroughly fused with base metal at all sections of weld, and penetration of weld shall include unbeveled portion and extend to inside walls of pipe.

Remove foreign matter from ends of pipe lengths before tacking and welding. Align pipe lengths straight with abutting pipe ends concentric. Space and tack weld pipe to prevent lapping or misalignment during welding.

Perform welding in accordance with latest accepted practice applicable to particular service, by qualified welders.

Do not make direct welded connections to valves, expansion joints, tanks or other items which are subject to future removal for repair.

Welding will not be allowed along the east wall of Building 9 and the west wall of Building 10 over the paper machines. The Contractor must protect this equipment as well as all other equipment from physical damage.

ELECTRICAL EQUIPMENT AND MOTORS

The Contractor shall provide all electrical equipment normally furnished integrally with mechanical equipment by the manufacturers of the mechanical equipment specified herein. Other motor starters, switches and electrical thermal protection as well as all labor and other necessary material for wiring of mechanical equipment will be covered under Division 16 work.

All electric motors furnished with mechanical equipment shall conform with the latest issues of applicable ANSI, IEEE and NEMA Standards.

The Contractor shall furnish motors of sufficient capacity to operate associated driven equipment continuously under all anticipated conditions of load and ambient temperature without overload. Motor horsepowers shall be at least as great as shown on the Drawings or as specified herein. Motors shall be rated for 40 C maximum temperature rise during continuous operation.

NOISE AND VIBRATION

All equipment shall operate quietly and without excessive vibration. The Contractor shall remedy objectionable noise and vibration before final acceptance. Power driven equipment supported from the building structure shall be installed in such a way to effectively isolate vibration. Provide isolating springs, rubber, or other resilient supports, mountings and piping hangers as required for this purpose. No rigid piping, conduit, equipment or part of the building structure shall restrict the freedom of motion of flexibly mounted equipment.

LABELS

Label all major mechanical equipment, such as pumps, panels and their electrical controls, etc, with white on black engraved plastic nameplates.

CLEANING

Before equipment and piping systems are turned over to the Owner, the Contractor shall thoroughly clean out scale or other foreign matter. The equipment and systems shall be operated for as long a period as is required to thoroughly clean out each entire installation with return water being wasted to drain until system is thoroughly cleaned.

At the completion of the work, all parts of the installation shall be thoroughly cleaned. All equipment, pipe, valves and fittings shall be cleaned of grease, metal cuttings, etc, as well as sludge which may have accumulated by the operation of the system for testing. Any stoppage or discoloration, or other damage to parts of the building, its finish or furnishings due to the Contractor's failure to clean the piping systems properly, shall be repaired by the Contractor.

TESTING

The various piping systems shall be flushed out and given a hydrostatic test in conformance with applicable standards and requirements. Air tests may be used when approved by the Engineer. An air test shall be used on the ammonia piping system.

Flushing and hydrostatic tests shall be made with water at about 60 F and then drained, if necessary, to prevent freezing.

During hydrostatic tests, the Contractor shall check his work and repair any defects such as leaky valve glands, or pipe joints.

During air tests, each joint shall be brushed with a liquid soap solution for detecting leaks.

Unless otherwise specified, all piping shall be hydrostatically tested to 50 percent above operating pressures. Tests shall be for two hours duration, during which time piping shall show no leaks and during which time no sealing of leaks will be permitted.

If piping to be tested is subject to freezing conditions, and postponement of test will hold up progress of the job, an air test of piping may be used in lieu of the hydrostatic test specified above, only with prior approval of the Engineer. Piping

shall be tested to 100 psi with air for a period of eight hours, during which time pressure drop in system shall not exceed 5 psi. Piping shall be made to comply with this test and re-tested until test requirements are met.

Test drainage, including underground sewers, inside storm water piping, and vent piping, by filling with water to overflowing at roof; or, if tested in sections, by filling each section with water to overflowing ten feet (10') above, so that all of each section, except topmost, is tested with head at least ten (10') feet. Water level must remain constant for 15 minutes, minimum.

All buried, concealed or covered piping shall be tested prior to burial, concealment or covering.

Remove and replace all material which is found defective during testing. Do not caulk leaky joints. Use of wicking in tightening leaking joints is not permitted.

ROTAMETERS

Furnish and install where shown on the Drawings the required rotameters to serve in the ammonia, alum and polymer feed systems. Rotameters shall be of clear acrylic plastic body design with integral metering tubes. Clean out plugs, floats, float stop springs, line connectors and valve stem and seats shall all be of 316 SS. Rotameters shall be equal to Brooks-Mite Model 2001, Size 8-75F as manufactured by Brooks Instrument Division of Emerson Electric Company.

SECTION 15.2 - DRAINAGE SYSTEMS

GENERAL

Mechanical grooved pipe couplings and fittings as manufactured by Victaulic shall be used for storm and roof drainage systems, unless otherwise indicated.

PIPING

Piping shall be standard black steel pipe conforming to ASTM Specification A-53, Grade B, of standard weight wall thickness and square cut grooved in accordance with the coupling manufacturer's specifications.

COUPLINGS

Couplings shall be cast of malleable iron conforming to ASTM A-47 or ductile iron conforming to ASTM A-536, Victaulic Style 77 with Grade H gaskets and plated nuts and bolts for all line and fitting joints.

FITTINGS

Fittings shall be of fabricated steel conforming to ASTM A-53, Grade B with grooved or shouldered end design to accept grooved mechanical couplings without field preparation.

FLANGES

Flanges shall be cast of malleable iron conforming to ASTM A-47, Victaulic Style 741 with Grade H gaskets.

ASSEMBLY

Pipe ends shall be clean and free from indentations, projections and roll marks in the area from pipe end to groove for proper gasket sealing.

The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service as specified.

A thin, uniform coat of Victaulic lubricant shall be applied by brushing lubricant on the pipe ends around the entire pipe

circumference and inside the coupling housing, and by brushing lubricant on the gasket lips and the entire exterior of the gasket. The gasket shall be placed over one pipe end, the pipe ends aligned and brought together and the gasket positioned between the groove on each pipe end.

The housing shall be assembled over the gasket with the housing key section engaging both grooves. The bolts shall be inserted, nuts started and uniformly tightened until the housing bolt pads are firmly together, metal-to-metal.

SUPPORT

Horizontal piping - No pipe length shall be left unsupported between any two couplings nor shall any pipe be left unsupported whenerver a change in direction of line flow takes place. In no case shall the distance between supports exceed the following:

Pipe Size	Maximum Spacing
4"	12'
5-8"	14'
10"	16'

Vertical piping - Vertical piping shall be supported at every other floor or every other pipe length whichever is most frequent. The base of the riser or base fitting shall be set on a pedestal or foundation.

CAST IRON PIPING

Furnish and install cast iron piping where indicated on the Drawings. Below ground piping shall be extra heavy cast iron hub and spigot soil pipe and fittings with neoprene compression type gaskets conforming to Commercial Standard CS-188 and Cast Iron Soil Pipe Institute Standard 301-63T.

Above floor cast iron piping, where indicated, shall be standard weight hub and spigot soil pipe and fittings or hubless cast iron pipe with neoprene gasket sleeve, and stainless steel sleeve and clamps.

VITRIFIED CLAY PIPE

Furnish and install vitrified clay pipe where indicated on the Drawings. Piping shall be extra strength vitrified clay pipe having physical and chemical properties conforming to ASTM Standard C-200.

SECTION 15.3 - PIPING AND VALVING

FRP PIPING

Furnish and install FRP piping where indicated on the Drawings. FRP piping shall be equal to A. O. Smith Green Thread or Fiber-cast F-Chem 1222. Piping shall be installed in accordance with the manufacturer's instructions.

PVDC PIPING

Furnish and install CPVC Schedule 80 piping where indicated on the Drawings. CPVC piping shall conform to ASTM D-1785, as manufactured by Celanese Piping Systems or Engineer approved equal. Piping shall be installed in accordance with the manufacturer's instructions.

STAINLESS STEEL PIPING (AT AERATION LAGOON)

Furnish and install stainless steel piping at the aeration lagoon where indicated on the Drawings. The 6" liner pipe shall be 304L S.S. welded tubing (6" O.D. x 14 gauge). The 10" liner pipe shall be 304L S.S. welded tubing (10" O.D. x 12 gauge). Fitting connectors shall be belled on both ends for field welding. Tubing and fittings shall be equal to "Felkerweld" as manufactured by Felker Bros. Mfg. Co.

AMMONIA PIPING

Furnish and install black steel seamless piping for ammonia service where indicated on the Drawings. Piping shall conform to ASTM A-53 or A-106, Grade B, Schedule 40. Fittings shall be forged steel socket welded conforming to ANSI B16.11, unless otherwise indicated.

WATER PIPING

Furnish and install black steel seamless piping for water service where indicated on the Drawings. Piping shall conform to ASTM A-53 or A-106, Grade B, Schedule 40. Fittings shall be forged steel socket welded conforming to ANSI B16.11, unless otherwise indicated.

COMPRESSED AIR PIPING

Furnish and install black steel seamless piping for compressed air service where indicated on the Drawings. Piping shall conform to ASTM A-53 or A-106, Grade B, Schedule 40. Fittings shall be forged steel socket welded conforming to ANSI B16.11, unless otherwise indicated.

HEATING TRACING FOR PIPING

Furnish and install freeze protection heat tracing, where indicated on the Drawings, for alum, polymer, compressed air, and combined phosphoric acid and ammonia service. Freeze protection tracing shall be an electrical heating strip of self-limiting, parallel circuit construction consisting of a continuous inner core of conductive material between two parallel cooper bus wires equal to the Auto-Trace self-limiting heater system as manufactured by Chemelex.

During installation the strip shall be cut-to-length at the jobsite to match as-built pipe requriements. The thermal rating of the heating strip shall be 3 watts per foot based on maintaining 50°F for freeze protection. Heat loss shall be determined for each service and the required heat tracing shall be installed in accordance with the manufacturer's recommendations. After heat tracing, piping shall be covered with at least 1" thick fiberglass insulation and .016" thick weather resistant aluminum jacket. An ambient sensing thermostat shall be provided to deactivate the freeze protection system during warmer weather.

VALVING

<u>For Alum, Polymer, Phosphoric Acid and Combined Ammonia and Phosphoric Acid Service</u>

Valving for the above services shall be all TFE lined plug valves. Complete TFE lining shall cover all wetted surfaces in the body of the valve, on the flange faces, covering the plug and in the top seal. The valve body shall have a one-piece continuous TFE lining. Molded TFE covering on the plug shall extend up the stem through the top cap. A molded TFE top seal shall prevent external leakage by sealing between the plug stem and the top cap. Valves shall have a TFE molded plug, tapered for positive seating and shall provide positive, drop tight shut-off. Valves shall be the non-lubricating type equal to Durco T-Lined valves as manufactured by the Duriron Company. Furnish Required valve operating wrenches.

For Ammonia, Water and Compressed Air Service

Valving for the above services shall be ductile iron plug valves, non-lubricating type with positive shut-off. Valves shall be equipped with ductile iron tapered plugs, TFE sleeves and TFE diaphragms with reverse lip design providing positive stem sealing. Valves shall be equal to Durco G 4 Sleeveline valves as manufactured by the Duriron Company. Furnish required valve operating wrenches.

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WET WELL PUMPS SPECIFICATION

Furnish three wet well pumps complete with base plates, motor drives and accessories. The pumps shall be of the horizontal self-priming centrifugal type, equal in construction and performance to the "T" series self-priming sewage pumps as manufactured by the Gorman-Rupp Company, specifically designed for the handling of industrial paper mill wastewater.

Each pump must have the necessary characteristics and be properly selected to perform under these operating conditions:

Capacity, in g.p.m.	1500
Total dynamic head, in ft.	30
Total dynamic suction lift, in ft.	6
Maximum priming lift, in ft.	18
Design r.p.m.	950

Each pump at its rated speed shall be designed to retain adequate liquid in the pump casing to insure unattended automatic reprimming in a complete open system without suction or discharge check valves and with a dry suction leg. Upon completion of repriming cycle, pumps shall deliver full rated capacity at rated TDH at the designed total dynamic suction lift.

The pumps shall be 8 inch Model T8A3-B.

The openings and passages of the pump shall be large enough to permit the passage of a sphere 3 inch in diameter and any trash or stringy material which can pass through the average house collection system. The pump must be equipped with a removable cover plate, allowing complete access to pump interior to permit the clearance of stoppages and to provide simple access for service and repairs without disturbing suction or discharge piping.

The pump shall also be fitted with a replaceable wear plate. Replacement of the wear plate, impeller and seal shall be accomplished through the removable cover plate. The entire rotating assembly, which includes bearings, shaft, seal, and impeller, shall be removable as a unit without disturbing pump volute or piping.

The impeller shall be 2-vane, semi-open, non-clog, cast in ductile iron, with integral pump-out vanes on the back shroud, and shall thread onto a pump shaft of high carbon steel.

WET WELL PUMPS SPECIFICATION (Cont'd)

Means shall be provided for external adjustment of the impeller to the wear plate.

The shaft shall be covered and protected with a removable sleeve. The shaft shall be contained within a bearing pedestal of ample size to contain heavy duty ball thrust bearing and radial bearing of adequate size to withstand all imposed loads. Bearings shall be oil lubricated, with the bearing pedestal cooled by pumped liquid.

The pump shaft shall be sealed against leakage by a balanced mechanical seal. Both the stationary sealing member and mated rotating member shall be of Tungsten-Titanium carbide alloy.

Each of the mated carbide surfaces must be ground and polished. To insure the seal faces are in full contact at all times, the stationary seal coat must be double floating and self-aligning during periods of shock loads that will cause deflection, vibration and axial or radial movement of the pump shaft.

The mechanical seal shall be installed within a separate oil filled reservoir of the pump pedestal, the oil being both lubricating and cooling media.

The seal must be removable and replaceable through the cover plate opening.

The mechanical seal must be warranted for a minimum period of four (4) years from date of shipment.

The pumps shall incorporate molded one-piece tapered suction check valves that can be removed or installed through the removable cover plate opening without disturbing the suction piping.

The pump volute casing shall contain no openings of a lesser diameter than the sphere size specified. Screens or any internal devices that create a maintenance nuisance or interfere with priming and performance of the pump will not be permitted.

Motor drives shall be suitable for 480 volt, 3 phase and 60 Hertz. Furnish flexible couplings and coupling guards.

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CHEMICAL FEED PUMPS SPECIFICATION

Furnish four chemical feed pumps complete with actuators, amplifier panels and back pressure valves. Pumps shall be of the hydraulically balanced diaphragm type wherein a measuring piston reciprocates within a cylinder and causes hydraulic oil to deflect a flat diaphragm. A compensator valve below the hydraulic oil level shall automatically provide make-up of oil leakage past the piston seals. The hydraulic system shall include a pressure relief valve to protect all working parts against damage from excess process or hydraulic pressure. The hydraulic fluid chamber shall have an automatic air bleed system, vented to the main gear box oil reservoir. Furnish a pulsation dampener with each pump.

Capacity adjustment from 0 to 100% capacity shall be by means of change in piston stroke length, while the pump is either idle or operating. Capacity shall be automatically adjustable through use of a reversible AC motor actuator operating directly to position the stroke length. The actuator shall operate electrically by a transmitting amplifier receiving a 4-20 ma dc signal.

All working parts, including the worm gear assembly, bearings, shaft connecting rods and piston cylinder assembly shall be mounted within a partitioned gear box housing, and shall operate submerged in an oil compounded for optimum hydraulic and lubricating properties.

Valves shall be of the free-seating ball type, with valve seats having knife edge contact. Valves and seats shall be individually replaceable. All process head parts shall have compression seals with flat gaskets or "O" rings.

The drive motors shall be totally enclosed suitable for 480 volts, 3 phase, 60 Hertz.

The pumps shall be designed according to the conditions defined below and shall be suitable for handling the products indicated.

AMMONIA FEED PUMP

Product	Ammonia
Specific gravity	.96
Pumping temp of liquid	Outdoor ambient
Viscosity @ pumping temp	Less than 50 cps
Vapor press. @ pumping temp	8.5 psia
Solids content	None
Maximum flow	8.33 gph
Operating pressure	25 psig
Suction pressure	Flooded
Design pressure	250 psig
Stroke length	1.0 inch
Piston size, dia.	1.0 inch
Strokes per minute	58
Valve material	316 S.S.
Seat material	316 S.S.
Valve and cap gaskets	TFE
In and out connections	1/2 NPTF
Valve housing	316 S.S.
Diaphragm material	TFE
Reagent head	316 S.S.
Intermediate head	None
Drive motor	1/2 HP
Model	Equal to Pulsafeeder CPS1-AE
Backpressure valve	1/2" 316 S.S.
Pulsation damper including charging valve and press gauge	Equal to Pulsatrol Model 38

ALUM FEED PUMP

Product	Alum
Specific gravity	1.5
Pumping temperature	Indoor ambient
Viscosity @ pumping temp	50 CPS
Vapor press. @ pumping temp	1.0 psia
Solids content	None
Maximum flow	33 gph
Operating pressure	25 psig
Suction pressure	Flooded
Design pressure	150 psig
Stroke length	1.0 inch
Piston size, dia.	1.5 inches
Strokes per minute	75
Valve material	Alumina ceramic
Seat material	FTFE
Valve and cap gaskets	TFE
In and out connections	1/2" NPTF
Valve housing	FTFE
Diaphragm material	Hypalon
Intermediate fluid	Glycol and water
Drive motor	1/2 HP
Model	Equal to Pulsafeeder HS1-AE
Backpressure valve	1/2" FTFE
Pulsation dampener including charging valve and press. gauge.	Equal to Pulsatrol Model 38DD

PHOSPHORIC ACID FEED PUMP

Product	Phosphoric Acid
Specific gravity	1.6
Pumping temperature	Indoor ambient
Viscosity @ pumping temp	12 CPS
Vapor press. @ pumping temp	10 mm Hg.
Solids content	None
Maximum flow	2.1 gph
Operating pressure	25 psig
Suction pressure	Flooded
Design pressure	250 psig
Stroke length	1.0 inch
Piston size, dia.	0.5 inch
Strokes per minute	58
Valve material	TFE (pure)
Seat material	20 S.S.
Valve and cap gaskets	TFE
In and out connections	1/2" NPTF
Valve housing	20 S.S.
Diaphragm material	Vinton
Intermediat fluid	Glycol and water
Drive motor	1/2 HP
Model	Equal to Pulsafeeder HS1-AE
Backpressure valve	1/2" 20S.S.
Pulsation dampener including charging valve and press. gauge	Equal to Pulsatrol Model 38

POLYMER FEED PUMP

Product	Polymer
Specific gravity	1.0
Pumping temperature	Indoor ambient
Viscosity @ pumping temp	Less than 1000 CPS
Vapor press. @ pumping temp	1.0 psia
Solids content	None
Maximum flow	300 gph
Operating pressure	25 psig
Suction pressure	Flooded
Design pressure	100 psig
Stroke length	3.2 inches
Piston size, dia.	3.0 inches
Strokes per minute	58
Valve material	316 S.S.
Seat material	316 S.S.
Valve and cap gaskets	TFE
In and out connections	2½" NPTM
Valve housing	316 S.S.
Diaphragm material	Hypalon
Intermediate fluid	Glycol and water
Drive motor	2 HP
Model	Equal to Pulsafeeder HS4-AE
Backpressure valve	1" 316 S.S.
Pulsation dampener including charging valve and press. gauge	Equal to Pulsatrol Model 230

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PHOSPHORIC ACID TRANSFER PUMP SPECIFICATION

Furnish one phosphoric acid transfer pump complete with magnetic drive equal to Jabsco Model 17870-0001. Pump shall be constructed of CPVC epoxy plastic suitable of handling phosphoric acid, shall have a capacity of 7 gpm and head up to 14.7 ft. No metal shall come in contact with the fluid. Motor shall be totally enclosed, 1/40 hp, 115 volt, single phase, 60 Hertz.

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Polymer Feed System Specification

Furnish one polymer feed system completely shop assembled consisting of a feeder hopper, feeder, polymer atomizer, wetting chamber, mixing tank, mechanical mixer, air scrubber, exhaust blower, level probes, motor operated transfer valve aging tank, dilution rotameter and control panel.

Feeder shall be suitable for dispensing 12.5 pounds per day of Nopcofloc 154 dry polymer. Feeder shall employ a double auger metering design to ensure accurate, continuous and constant density material flow without flooding or bridging. Feeder shall be dust-tight and shall be designed to provide easy cleaning without the need for removing the feeder or disassembling flexible connectors, hoppers, etc. The feeder and all parts in contact with the material shall be constructed of 304 SS. Seals shall be of teflon. Feeder shall be driven by a gear motor controlled by an adjustable timer on the control panel. The feeder shall have a metering accuracy of ± 2% maximum deviation based on one minute test samples by weight.

The feeder hopper shall be constructed of 304SS and have a minimum capacity of three cubic feet including the feeder chamber.

The polymer atomizer shall consist of a positive displacement blower and appropriate nozzle to disperse the dry polymer and to convey the dispersed polymer to a wetting chamber in a completely enclosed system.

The wetting chamber shall incorporate a cyclone action mixing nozzle to completely wet the dry polymer as conveyed by the atomizing system. Wetted metal parts shall be constructed of 304SS. Wetted polymer shall drop into the mixing tank by gravity.

The mixing tank shall have a capacity of 50 gallons and be constructed of 304SS complete with a full cover on which shall be installed the wetting chamber, exhaust air scrubber, high and low level probes and a slow speed mixer. Mixer shall be designed to provide proper mixing at speeds not exceeding 400 rpm.

The motor operated transfer valve shall be sized for quick

transfer of the mixed polymer to the aging tank on a demand signal from the level probe in the aging tank. Valve shall be constructed of 316SS.

The aging tank shall have a capacity of 200 gallons and provide at least one hour of aging time when feeding a maximum rate and preparing a 0.1% solution. Tank shall be constructed of 304SS and shall be complete with a full stainless steel cover on which is mounted the demand transfer level probe.

A NEMA 12 control panel shall be furnished including all controls for automatic control, operational lights and manual over-ride for the major motor driven items. An interlock shall be provided to prevent feeding of dry polymer unless water and air are being supplied to the wetting chamber. The interlock shall be wired to a visual and audible alarm station. The dry polymer feeder and mixer shall be controlled independently from timers in the panel. Control functions shall be suitable for operation from a 115 volt, 60 Hertz, single phase power supply.

Magnetic starters providing both overload and under voltage protection shall be provided for each motor. Starters shall be mounted in the control panel and wired to their respective motors. Motors shall be suitable for a 480 volt, 60 Hertz, three phase power supply.

The polymer feed system shall be arranged in a complete pre-assembled, wired and piped unit. The water supply line of the system shall include a main shut-off valve, pressure reducing valve, pressure switch, solenoid valve, control valve and pressure gauge, all suitably sized and selected. A dilution rotameter and control valve shall be furnished for installation in the dilution line. The rotameter shall be sized so that the metered polymer solution can be diluted to 0.1% before it is applied.

A hopper low level switch shall be included and installed in the hopper to energize a lamp and sound an audible alarm in the control panel when material reaches a predetermined low level.

The unit shall be equal to Acrison's "Polymair" Model 500-50-200.

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PHOSPHORIC ACID STORAGE TANK SPECIFICATION

Furnish one 250 gallon fiberglass storage tank suitable for handling phosphoric acid. Tank shall be flat bottom, vertical type 38" dia. x 54" high. Provide two 1" flanged connections 4" from the bottom of the tank and spaced 180° apart from each other. Also, provide one 1" flanged connection 4" from the top of the tank. Provide a removable cover with built-in vent. Storage tank shall be equal to Raven Industries Model B5503.

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BAR SCREEN SPECIFICATION

Furnish one bar screen unit completely shop assembled consisting of a circular arc bar screen assembly, rake, drive assembly and rake cleaning assembly.

Unit shall be designed for installation in a concrete channel (concrete channel by others) and shall be capable of screening the flow according to the conditions defined below:

Type of Waste	Paper Mill Wastewater
Flow - gpm	3000
Channel Velocity - fps	2.5
Screen Bar Clear Opening - in.	1"
Channel Width - ft.	3'-0"
Channel Depth - ft.	appox. 7'-9"
Rake Arm Length	6'-0"

Unit construction shall include a bar screen assembly consisting of mild steel bars of 3/8 inch by 2 inches in cross section. The bars shall be bent into circular arcs of 72 inches radius and secured in lateral mild steel support members at each end, comprising a screen frame. Their concave form shall face upstream with the 3/8 inch edges oriented parallel to the direction of flow.

The rake shall be supported and moved by two arms keyed to a drive shaft at the upper end. The rake shall be attached to the arms by a spring loaded, adjustable assembly to allow it to pivot away from the screen should a predetermined cleaning force or blockage be encountered.

All components of the drive assembly shall be of rugged design and be of sufficient strength to withstand all screenings loads without deflections which would cause interference between rake and screen or rupture of parts. Motor rating shall be 460 volts.

The rake cleaning assembly shall include a fabricated mild steel bar to which a flexible blade is attached. The relative motion of the wiper shall push screenings off the rake, over the top of the screen and to the downstream side thereof. A receptacle shall be furnished to collect the screenings for subsequent disposal.

A weather tight control panel suitable for outdoor installation shall be furnished containing a magnetic electric starter, components to coordinate a starting signal and limit switch. Required float switches, timer with differential pressure over-ride and On-Auto-Off selector switch shall be furnished.

All fabricated steel parts shall have one shop coat of primer paint with a finish coat of the supplier's standard. Coal tar epoxy paint shall be applied on all wetted surfaces.

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SUMP PUMPS AND SLIDE RAIL ASSEMBLY SPECIFICATION

Furnish a duplex sump pump and slide rail assembly unit complete with pumps, slide rail systems, float switches, alarms, starters and control panel. Pumps shall be the submersible type capable of delivering 200 gpm of boiler blowdown water at 160°F against discharge head of 20 feet. Pumps shall be 2 HP, 1725 RPM motor, suitable for 480 volts, 3 phase, 60 Hertz. Pumps shall have semi-open non-clog impeller, two vane design keyed to stainless steel shaft, with ejector vanes on back side for protection of seal chamber.

Accessories shall include: (1) two slide rail systems, with 4", 150 psi ANSI flanges and pedestals: (2) four mercury float switches, encapsulated in polyurethane foam for floatation and protection, with 20 ft. of cord and lead cord weight; and (3) one duplex control panel system, with "hand-off auto" switch, circuit breaker, starters, pilot light for "pump on" indication for each pump, and an alarm section with an "off-reset-normal" switch, bell and red light indication for alarm conditions.

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SKIM OIL STORAGE TANK SPECIFICATION

Furnish one skim oil storage tank complete with manhole cover, vent, inlet and outlet nozzles, drain, lifting lugs, heat tracing and insulation with aluminum jacketing. The tank shall be the vertical above ground type fabricated from high-quality Class A open-hearth steel plate. Tank size shall be 6' dia. x 6' high of approximately 1200 gallons capacity. Thickness of shells and heads shall be in strict accordance with Underwriter's specifications. All head and shell rings shall be one-plate construction.

Tank shall be lap-welded continuously on the outside, and tank welded on the inside according to Underwriters' specifications. All welding shall be electric-arc, performed by qualified welders. Exterior of tank shall be sandblasted and given a primer of red-oxide paint. Tank shall be tested and proven tight against leakage under a test pressure of not less than 5 psi nor more than 7 psi.

The following accessories shall be furnished for the tank; piping connections as shown on the Drawings, 30" dia. manhole with bolted gasketed cover, tank vent extending approximately 6'-6" from top of tank, 2" nozzle for electrical service to submersible pump and three equally spaced lifting lugs.

Tank shall be as manufactured by Buffalo Tank Division of Bethlehem Steel Corp., Enviro-Fab Inc. or Engineer approved equal.

Tank shall be electric heat traced and completely covered with 2" thick fiberglass insulation (6 lb/cu. ft. density) and a .016" thick weather resistant aluminum jacket.

Install electric heat tape in lower 1/3 portion of tank. Use two turns of Chemelex Electro-Wrap #2241A strip, S1-400-30 power connector and 46-30 end seal or Engineer approved equals. Approximately 38' of heat tape will be requried with thermal design rating of 16 watts per foot. Install a spare heat tape strip of two turns equal to the above for future use. Furnish thermostat controls (electro-Wrap #E109) for each strip. Mount bulb of control thermostat in accordance with manufacturer's recommendations using Electro-Wrap #35 bulb clamp kits.

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SKIM OIL STORAGE TANK SUMP PUMP SPECIFICATION

Furnish a sump pump to serve in the skim oil storage tank. Pump shall be the submersible type capable of discharging 80 gpm of water into a primary clarifier against a discharge head of 25 feet. Pump shall be 1 HP, 1725 RPM motor, suitable for 480 volts, 3 phase, 60 Hertz. Pump shall have a semi-open, non-clog impeller, two vane design keyed to stainless steel shaft, with ejector vanes on back side for protection of seal chamber.

DIVISION 16 - ELECTRICAL WORK

SECTION 16.1 - GENERAL INFORMATION

GENERAL

The requirements of the Contract Documents, including the Instructions to Bidders, General Conditions, and the Special Conditions shall govern the work of the Specifications.

SCOPE OF WORK

The electrical work to be executed under this contract shall include, but not be limited to the following:

A. Disconnecting and removal of certain existing equipment from the present plant.

B. Receiving, inspecting, unloading, storing, installing and connecting certain, Owner-furnished, new equipment.

C. Furnishing and installing materials for modifications to certain existing equipment and equipment systems as specified herein.

D. Furnishing and installing other required equipment and materials herein specified.

E. Installing and testing the various power and control systems and placing the electrical systems in complete and proper operation. Field hook-up and wiring of instrumentation and control equipment.

CONTRACTOR-FURNISHED EQUIPMENT AND MATERIAL

In general, the Contractor-furnished equipment and material in this Specification includes:

A. All luminaires, lamps, supports, wiring devices, conduit and fittings, conductors, panelboards, transformers, etc., to provide the new lighting systems.

B. All power center components, motor control center components, motor controls, wiring devices, conduit and fittings, conductors, terminations, etc., to provide the complete power and control systems.

C. All ground rods, conductors, splices, terminations, etc., to provide the necessary additions to the plant grounding system.

SHOP DRAWINGS

Owner-Furnished and Existing Equipment

Shop drawings of Owner-furnished and existing equipment will be made available at the jobsite, if and when they are available, otherwise the existing equipment will be made available for inspection.

All of this work may not be detailed on the Bid Drawings and/or may be referenced to Manufacturer's Shop Drawings. A lack of this detailed information before Bid Date shall not constitute extra work nor will the Contractor be entitled to extra compensation.

Contractor-Furnished Equipment

Submit shop drawings in accordance with the Special Conditions for the following items:

A. Cable; power and control

B. Panelboards

C. Luminaires

D. Motor controls

E. Safety switches

F. Transformer

G. Wiring devices

CODES AND STANDARDS

This installation shall comply with all requirements of all legally constituted authorities having jurisdiction over any part of this work. These requirements supplement these Specifications and take precedence in case of conflict.

All materials and equipment furnished by this Contractor shall comply with the applicable Standard in every case where such a

Standard has been established. The Codes and Standards listed in the Special Conditions of this Specification shall be considered as minimum standards for this project.

Where the work required by the Drawings and Specifications is above the Standards as set forth by these codes and recommendations, it shall be done as shown on the Drawings and/or specified herein.

INSTALLATION

Contractor shall install all of the Owner-furnished equipment and Contractor-furnished equipment and materials to include all interface connections of power and control to and between components of this equipment and existing equipment, all as set forth on the contract drawings, manufacturer's shop drawings and these Specifications.

Special attention is directed to components of Owner-purchased equipment, where all interface electrical connections shall be done by this Contractor.

Also, special attention is directed to other Divsiion of these Specifications describing systems or modifications to systems requiring electrical work not covered by Division 16 of the Specifications, but included in this Contract.

TESTING

Acceptance tests for electrical equipment and materials to be performed under this Contract are detailed in Section 16.4 of these Specifications.

In general, the equipment and materials upon which acceptance tests are to be performed are as follows:

A. Power Cables, 600 V and lower

B. Control Devices

C. Control wiring

D. Transformer, special

E. Rotating Equipment

F. Grounding

Other tests are to be conducted under this Contract as specified in other Sections of these Specifications, and may involve other electrical requirements.

SECTION 16.2 - ELECTRICAL MATERIALS

GENERAL

Except where otherwise noted on the Drawings or in these Specifications, the electrical materials used in this work shall be Underwriter's Laboratories Inc. listed at the time of installation and shall bear the UL label.

All materials shall be new unless otherwise noted.

Where materials, equipment, apparatus or other products are specified by manufacturer, brand name, type or catalog number, such designation is to establish standards of desired quality and style and shall be the basis of the bid. Materials so specified shall be furnished under the Contract, unless changed by mutual agreement. Where two or more designations are listed, choice shall be optional with the Contractor.

RACEWAYS

General

Provide all raceways complete with all devices and plates.

Zinc-Coated, Rigid Steel Conduit

Provide zinc-coated, rigid steel conduit, hot dipped process, conforming to latest ANSI Specifications for rigid steel conduit, as manufactured by Youngstown or Pittsburgh.

Alloy Steel, Rigid Conduit

For underground use, provide zinc-coated alloy steel (2% nickel and 1% copper) of a corrosion resistant type, as manufactured by Youngstown.

Flexible Steel Conduit

Provide flexible steel conduit with an oil-proof liquid-tight jacket, conforming to American Brass "Sealtite", Type "UA" for 1/2" to 1-1/4" sizes inclusive, and Type "EF" for 1-1/2" and larger sizes.

Fittings for Rigid Steel Conduit

Fittings shall have cast or malleable iron bodies, cadmium or zinc-plated, with taper threads and tapped holes for screw-attached cover plates. For installation in moist or wet locations, fittings shall have gaskets of an appropriate material and shall be hot-dipped galvanized heavy cast metal. For installations in dry locations, fittings may have stamped metal covers. Fittings shall be of the type providing maximum wiring space, and shall be Appleton Form 35, Crouse-Hinds Form 8, Pyle National Form R or other approved by Engineer.

Expansion Fittings for Rigid Steel Conduit

Fittings shall have cast or malleable iron bodies, with threaded end caps for receiving the fixed and moveable conduits and with insulated bushings and packing and pressure ring assembly, and copper bonding jumper assembly. Fittings shall provide for a minimum of 2" movement of the conduit in either direction. Fittings shall be Appleton Type XJ, Crouse-Hinds Type XJ or O.Z. Type EX.

Liquid-Tight Flexible Steel Conduit Fittings

Fittings shall be designed to maintain the oil-tight and liquid-tight features of the installation, and shall be T & B 5200 Series, Appleton SG Series, or other, approved by Engineer.

Locknuts and Bushings for Rigid Steel Conduit

Locknuts shall be made of malleable iron, cadmium plated. Bushings shall be made of malleable iron or steel for all sizes, shall be cadmium plated and shall have molded insulating insert of thermosetting plastic. A grounding lug shall be provided on all bushings. Locknuts and bushings shall be manufactured by Steel City, Thomas & Betts, Tomic, or other, approved by Engineer.

CONDUIT BOXES

General

Outlet, switch, junction and pull-boxes and cover plates shall be hot-dipped galvanized or cadmium plated. Boxes for installation in dry locations shall be of stamped steel, of not less than 12 gauge, with stamped steel accessories. Boxes or fittings for installation in damp or wet locations shall be of cast iron or malleable iron, cadmium finish, Type FS with covers and gaskets.

Cast or Malleable Boxes

Cast or malleable boxes shall be as manufactured by Crouse-Hinds Co., Appleton Electric Co., Pyle National Co., Benjamin Electric Thomas & Betts Co., or other, approved by Engineer.

Special Junction and Pull Boxes

Special junction and pull boxes shall be of sheet steel and when containing more than 6.5 cu. ft. shall be reinforced with angle iron. All boxes shall conform to N.E.C. minimum requirements for wiring space and for minimum gauge of metal.

CONDUCTORS

General

Provide all necessary wire and cable to complete the project.

All wire and cable shall be stranded copper of not less than 98 percent IACS conductivity and shall meet the standard specifications and tests for such materials and construction established by ASTM, NEMA, UL, ANSI, AEIC and IPCEA, where applicable.

Materials, construction data, insulation thickness, jacket thickness, test data and samples shall be submitted for approval upon request.

Type RHW, 600 Volt Wire and Cable

Wire for general use in sizes No. 12 AWG and larger shall be tinned, stranded, annealed copper, insulated with a moisture and heat resisting compound conforming to ASTM Standard and meeting the requirements of IPCEA Standards for Type RHW, 75C, 600 Volts.

Signal Cable

Signal cable for 4-20 ma signals shall conform to signal equipment manufacturer's requirements.

Ground Conductors

Ground conductors shall be stranded bare copper.

Ground conductors shall have not less than 30% of the circular mill area of the largest circuit conductor, but not less than No. 12 AWG if protected and No. 8 AWG if unprotected.

Ground conductors installed in raceways with circuit conductors shall have 600 Volts insulation, green in color.

Bonding jumpers shall be copper and of a cross-sectional area not less than their corresponding grounding conductors.

Ground rods shall be 3/4" sectionalized copper or copper-clad steel rods.

ELECTRICAL SUPPORTING DEVICES

Brackets, Braces and Supports

Provide all brackets, braces, supports and other miscellaneous materials as required to install all conduit runs, luminaires, panelboards, transformers, control panels, switches, motor starters and/or other items of the entire electrical system.

The kind of material, size and design of brackets, braces and supports shall be adequate to accommodate the working duty imposed and shall be installed at the location without causing any undue stresses in the building structure.

Clamp supports for fastening individual conduits directly to steel shall be similar to those manufactured by Appleton Electric Company (Sta-Tite Pipe Hangers) or other, approved by Engineer.

For suspended equipment from building steel provide beam clamps similar to Grinnell Figure 131 or approved equal; eye nuts similar to Grinnell Figure 110-R or approved equal; ring hangers similar to Grinnel Figure 108 or other, approved by Engineer.

Suspended equipment from concrete, masonry, wood, etc. shall be secured to such by a steel fitting similar to Grinnell Figure 252 or other, approved by Engineer.

Steel channel sections with "nut seats" or "beam grips" for grouped vertical run supports shall be as manufactured by Delta Star Electric Company or other, approved by Engineer.

Where automatic stud welders and studs are used for securing equipment supports, etc., to building steel, they shall be as manufactured by Nelson Specialty Equipment Corporation.

The minimum diameter of round steel rod permissible for hangers and supports is 3/8" with threaded ends only. All steel hard-

ware, e.g. bolts, nuts, washers and hanger rods used with the electrical installation shall be galvanized or cadmium plated.

Expansion Anchors

Expansion anchors for fastening new work to masonry, shall be multiple unit construction which will develop a pull-out power equal to or greater than the strength of the bolt.

Single lead sleeve anchors will not be acceptable. Anchors shall be "Redhead" concrete anchors manufactured by Phillips Drill Company, or "cinch" anchors as manufactured by the National Lead Company, or other, approved by Engineer.

Sleeves and Inserts

Provide sleeves for all openings in walls and floors as required. Inserts shall be Ackerman-Johnson, or equal, for small work and expansion shields for large work.

WIRING DEVICES

Wall Switches, Lighting

General purpose local wall switches were used for controlling lighting fixtures and devices, shall be toggle type, Specification Grade.

All switches under this heading shall have a minimum rating of 20 amperes at 120 Volts A.C.

Plates for use with general purpose wall switches, installed in surface mounted conduit fittings, shall be stainless steel.

Switches shall be Hubbell No. 1221, Bryant, General Electric or other, approved by Engineer.

Wall Plug Receptacles

Duplex convenience outlets shall be Specification Grade, 3 wire, grounding type, 20 ampere, 125 volts A.C., Hubbell No. 5362, Bryant, General Electric or other, approved by Engineer.

Receptacles used in lighting and small motor circuits shall be Specification Grade, twist-lock, 15 amperes, 125 volts A.C., Hubbell No. 7582, Bryant, General Electric or other, approved by Engineer.

Plates for use with lighting fixture outlets shall be stainless steel as manufactured by Hubbell, Bryant, General Electric, or other, approved by Engineer.

Plates for use with general purpose duplex convenience receptacles mounted in surface type FS conduit fittings shall be weather-proof lift cap type with gasket and made of fiberglass (gray color), Hubbell No. 5221, or other, approved by Engineer.

SAFETY SWITCHES

General

Safety switches shall be heavy duty, fusible or non-fusible, quick-make, quick-break, industrial type, horsepower rated, as required.

Fuses shall be in accordance with Subsection "Fuses".

Enclosure

Enclosure shall be NEMA Type 12 gasketed, or other, as required by N.E.C. due to location.

Switch Handle

Switch handle shall be in control of the switch at all times and shall be interlocked with the door, to prevent opening or closing unless switch is in the "open" position. An interlock defeater mechanism shall be provided.

Manufacturer

Switches shall be as manufactured by General Electric, I.T.E., Square "D", Westinghouse, or other, approved by Engineer.

MISCELLANEOUS MATERIALS

Electric Tape

General purpose tape for power and control conductors shall be Scotch No. 33+ all weather type, as manufactured by 3M Company.

Electrical Putty

Electrical insulating putty shall be "Scotch-fill".

Caulking Compound

Caulking compound shall be polysulfide base liquid polymer type, similar to "Thiokol" or "Lonolastic", made by Sonneborn Building Products, Des Plaines, Illinois, or "Kemkol" made by Chem-Masters Corporation, Chagrin Falls, Ohio, or other, approved by Engineer.

Flexible Electric Cords

Flexible electrical cords shall be all thermo-plastic, Type STO.

MOTORS AND MOTOR CONTROLS

General

All motors shown on the drawings shall be furnished with the Owner-furnished equipment.

Control devices such as aquastats, thermostats, electric-pneumatic and pneumatic-electric switches, etc., are specified in Division 15 - Mechanical of these Specifications, unless specifically indicated as included with Owner-furnished equipment.

Motor Starters

Provide magnetic starters for all 3-phase motors, unless specifically indicated as included with Owner-furnished equipment. Provide starters in separate enclosures, unless included or added to existing motor control centers.

NEMA 12 gasketed enclosures are standard for indoor installation except as noted otherwise. Provide NEMA 4 enclosures where exposed to dampness or for locations in corrosive atmosphere.

Allen-Bradley starters are specified to establish quality and general requirements. Comparable starters as manufactured by Westinghouse, General Electric, I.T.E. and Square D, are acceptable.

In each magnetic starter provide:

A. "Push-To-Test" light, with 120-6 Volt transformers.

B. Three overload relays - Properly sized for the actual motor nameplate current and motor operating conditions, with cover mounted reset button.

C. Minimum of two auxiliary contacts plus those scheduled.

D. Control transformer (unless otherwise indicated) for maximum control voltage of 120 Volt, complete with secondary fuse protection.

E. Provide Bulletin 800T heavy duty, oil-tight, with pilot light, momentary contact push-buttons or maintained-contact three position "Hand-Off-Automatic" selector switch with pilot lights as indicated on Drawings.

Full Voltage Magnetic Starters

Provide Bulletin 709 non-reversing and Bulletin 705 reversing magnetic starters, sized for the horsepower and current rating of the motor, NEMA Size 1 is minimum.

Combination Starters

Provide Bulletin 712 with fusible disconnect. Fuses shall be furnished per Subsection "Fuses".

Where combination starters with circuit breakers are shown, provide Bulletin 713, with breakers having 25,000 RMS symmetrical amperes interrupting capacity at 480 Volts.

Remote Controls

Provide Bulletin 800 T push-buttons and selector switches, heavy duty, oil-tight type, with pilot lights if indicated.

Provide flush mounting on panels and surface mounting for exposed conduit systems.

Provide momentary "Start-Stop" push-buttons at all motors out-of-sight of starter.

Provide 2 - maintain - contact three (3) position (1-2-3) selector switches with pilot lights for each position, all on a separate NEMA 4 enclosure, for mounting in Wet-Well Bldg. One selector switch shall be labeled "LEAD PUMP" and other switch labeled "LAG PUMP". All wires shall be terminated on terminal blocks. The front cover, on which the switches and pilot lights are mounted, shall be hinged.

All remote mounted push-buttons stations shall have provisions to padlock in "ON" and "OFF" positions.

FUSES

General

Provide a complete set of fuses for all fuse holders, including those in Owner-furnished equipment to which electrical connections are made under this Contract.

Replace all fuses blown during construction and testing.

Type

All low voltage fuses shall be one-time dual element type, and shall be "Fusetron" as manufactured by Bussman Mfg. Co.

PANELBOARDS

General

Provide all panelboards including breakers, bus bars, hinged door, lock, trim, and all appurtenances for a complete installation.

Westinghouse equipment is mentioned herein to establish minimum quality and general requirements. Comparable equipment manufactured by General Electric, I.T.E. or Square D may be provided upon approval by Engineer.

Panelboards

Provide dead front safety type, UL approved panelboards conforming with Fed. Spec. W-P-115. The bus size, the number of branch circuits, their ampere rating and number of poles for each panelboard is noted on the Drawings.

Provide solderless lugs, or connectors, in the correct number and sizes for conductors, or mains, on the load side of each branch circuit, and on ground and neutral bars.

Provide 98 percent conductivity copper or equivalent tin-plated aluminum buses.

Provide an insulated neutral bus and a bonded equipment ground bus, mounted at the opposite end of the structure from the mains, and having numbered screw or lug terminals for connecting of wires.

Circuit Breakers

Provide for panelboard use, molded plastic case, air circuit breakers conforming to Fed. Spec. W-C-375. Provide breakers with thermal magnetic trip units, and common trip bar for two pole breakers, connected internally to each pole so that the tripping of one pole will automatically trip all poles of each breaker.

Provide breakers of the trip-free and trip-indicating, plug-in type, with quick-make, quick-break contacts. Provide single or two pole breaker interchangeability.

Wall Mounted Panelboard (240 V A.C. Class)

Provide Westinghouse Type WQP, 1 phase, 3 wire, SN with QP plug-in Quicklag breakers. Rate breakers for a minimum of 10,000 amperes, symmetrical interrupting capacity. Provide minimum box dimensions of 20 inches wide by 5-3/4 inches deep. Provide minimum 5-inch top and bottom gutter, not including ground bus space, and 6-inch minimum side gutters.

Cabinets

Provide zinc-coated sheet steel cabinets conforming to the requirements of Underwriter's Laboratories, Inc. bearing their inspection label. Provide a primer coat and finish coat of the manufacturer's standard color on all cabinet surfaces, trim and doors. Provide NEMA 12 gasketed enclosure. Provide trims with adjustable trim clamps. Fit trims with hinged doors having combination lock and latch. Provide disc tumbler locks.

Mount a directory holder with clear plastic cover and metal frame on the inside of door. Mount a typewritten directory, properly identifying each circuit, under the clear plastic cover.

Provide panelboards with 1 and 2 pole, 20 & 50 ampere, calibrated thermal magnetic, temperature-compensated, quick-make, quick-break, trip free and individually removable breakers.

Provide all branch breakers with suitable branch circuit-locking devices.

SPECIAL TRANSFORMER

General

For 600 Volt and below, single phase, dry type transformers.

Type

Provide dry type, air cooled, two winding type transformers with size and voltage rating as indicated on Drawings.

Manufacturer

Provide transformers manufactured by General Electric, Westinghouse, I.T.E. Imperial or other approved by Engineer.

Construction

Provide each single phase transformer with a minimum of two - 2-1/2% F.C.A.N. taps. Each transformer is to be suitable for indoor/outdoor service and arranged for wall mounting as indicated on the Drawings.

For Transformers 15kVA and Above

Provide Class "H" insulation (average temperture rise not to exceed 150 degrees C. based on a 50 degrees C. ambient at full load). Maximum case temperature not to exceed 35 degrees C. rise above 50 degrees C. ambient at full load.

LUMINAIRES

General

Provide all necessary material to make the lighting installations as shown on the drawings. The lighting fixture nomenclature, as shown on the Drawings, shows the type of lighting fixture required for the various areas. All lamps, lighting fixtures, ballasts, and miscellaneous equipment and materials required to make a ready-to-operate lighting system, shall be provided.

All steel parts of the fluorescent lighting fixtures shall be finished equal to Parker Bonderite Iron Phosphate process, hot-bond sprayed and baked at 350°F, with heat-resistant, high-temperature white enamel. All white finishes shall have a minimum reflectance of 85%. All fixture and fixture components shall be UL approved and shall bear the UL label. All lamp holders for rapid-start lamps shall have silver-plated contacts. All fluorescent fixtures shall be equipped with high-power factor, two lamp ballasts. All ballasts shall have Certified Ballast Manufacturer's label of approval from the Electrical Testing Laboratories. The ballast shall be high-power factor with sound rating indicated on ballast; potting material shall be thermo-setting material similar to Jefferson "Dri-Lok". Ballasts shall be 110-125 volt, 60 Hertz, with operating temperatures not exceeding 90°C with 27°C ambient. All ballasts shall be individually fused with Bussman Type GLR or GMF fuses in HLR holders. Fuse rating shall be as recommended by the fixture manufacturer for the voltage, number and type of lamps for which the ballast is designed.

Mercury vapor lighting fixtures shall be of the types hereinafter specified, or as indicated on the Drawings, and shall be equipped with lamps.

Fixtures Schedule

Type A - Two lamp rapid-start 2/40W/T12/48, 430 ma. This fixture shall be vapor tight and all metal surfaces shall be coated with a white polyester high gloss enamel. Gasketing shall be 1/2" thick polyurethane sponge. The lens shall be sealed to prevent the entrance of moisture after installation. These fixtures shall be chain hung or surface mounted as noted on the Drawings. Fixture shall be Day-Brite Cat. No. WR41241 or Guth Cat. No. ACR6762/120.

Type B - Outdoor, mercury vapor, prismatic, wall bracket light fixture with photo-cell, 250 watt, Guth Cat. No. B17-561/120/PEC/CAB. Lamp shall be BT-28. Mount fixture 10' above ground on S.E. corner of Wetwell Building.

SECTION 16.3 - INSTALLATION

GENERAL

Installation of all equipment and materials shall conform with the National Electrical Contractors Association (NECA) Standards of Installation.

RACEWAYS AND FITTINGS

Raceways in Structures and Above Ground

Use metallic raceways unless specifically indicated otherwise. Install all raceways exposed, except underground.

Continuity

Provide continuous metallic raceways from outlet to outlet, and from outlet to cabinets, junction or pull-boxes. Enter and secure conduit to all boxes, to provide electrical continuity from the point of service to outlets. Provide double locknuts and bushings on termination of metallic conduits.

Size

Use raceways no smaller than 3/4 inch, except that 1/2 inch may be used for switch legs consisting of not more than 3 wires.

Raceways in Earth

Use rigid alloy steel conduit, elbows, and couplings for all runs below grade.

Raceways Exposed

Run exposed raceways in straight lines at right angles or parallel with walls, beams or columns.

Raceways Entering Structure Below Grade

Provide raceways with galvanized cast-iron wall entrance seals, having a watertight sealing gland assembly.

Straps and Hangers

Support raceways by straps, clamps or hangers, to provide a rigid installation. Perforated strap hangers and twisted wire attachments will not be acceptable. Do not support or fasten raceways to other pipe, or in a manner to prevent the ready removal of other pipe.

Joints and Connections

Make watertight all couplings and threaded connections in threaded conduit. Cut all joints square, ream smooth, and thread properly. Fit all box connections with two approved locknuts and one steel, plastic or fiber bushing forming a tight bond with box. Provide locknuts both inside and outside of the enclosure to which the conduit is attached. Provide grounding locknuts or bushings where required.

Stub-Ups

Conduit stubbed-up through concrete floors for connection to free-standing equipment shall terminate with a coupling flush with the finished floor. Rigid conduit shall be extended to equipment except, where required, liquid-tight flexible conduit may be used 6 inches above the floor.

Threads

Clean all threads before make-up. Coat all male threads with conductive compound before make-up.

Protection

Cap receways stubbed-up, including those in cabinets, immediately upon their installation. Screwdriver operated threaded flush plugs shall be provided in conduits from which no connections are made, or the ends shall be capped with a plumber's pipe cap.

Expansion Joints

Provide conduit expansion joint in all conduit runs crossing structural joints. Where differential settlement may occur, use deflection fittings.

Location Requirements

Use care in locating raceways in close proximity to high temperature radiating surfaces. Where crossings are unavoidable, clear covering of surface by at least 6 inches. All raceway runs shown on Drawings are diagrammatic. Determine exact locations in the field.

Motor Connections

All final connections from rigid conduit systems to motors shall be made with flexible conduit which shall not exceed 18 inches in length.

Conduit Supports

Individual conduit shall be fastened to steel members of structure by clamp supports. Individual conduits, where attached directly to concrete or masonry, shall be secured with two hole galvanized malleable iron pipe straps with expansive screw anchors of the proper size.

Where individual conduits are suspended from structure steel, they shall be supported by an adjustable wrought iron or galvanized steel ring hanger secured to an adjustable beam clamp by means of a rod of the proper diameter and length, threaded on both ends only and provided with eye nuts on both ends.

Individual conduits suspended from concrete, masonry, wood, etc., shall be supported similar to above, except that each rod shall be supported, using double nuts, from a steel fitting fastened to concrete, masonry, etc.

Where conduits are grouped on a common steel support, they shall be secured to same by galvanized U-bolts or two-hole galvanized malleable pipe straps.

Where a horizintal conduit rack support is suspended from building steel, it shall be a channel section, supported from adjustable beam clamps by means of rods, threaded on both ends only, provided with double nuts at bottom and an eye-nut at top.

Horizontal conduit supports suspended from concrete, masonry, wood etc., shall be similar to above, except that each rod shall be supported from a steel fitting fastened to end of rods, using double nuts.

Any damage to the galvanizing finish during installation of conduits, shall be repaired by painting with "Galvno" or an equal zinc-rich paint.

OUTLET BOXES AND PULL BOXES

Rigidly mount all boxes and provide screw fastened covers. Install pull boxes in locations that will be accessible after completion of project. Provide pull-boxes or junction boxes to limit conduit runs to 125 feet and to limit angles to the equivalent of 270 degrees. Additional pull-boxes may be added to facilitate wire pulling.

Boxes supported on concrete, brick, etc., shall be rigidly secured by proper size machine screws or bolts, and expansive type anchors. When boxes are mounted on structure steel, they

shall be fastened with approved clamp type supports which provide rigid and vibration proof support.

CONDUCTORS

General

Provide conductors from outlet to outlet and splice only at outlet or junction boxes. Circuit all feeders and branch circuits in accordance with Drawings.

Wire and cable shall be visually inspected for possible damage when received and before installation. Damaged wires and cable shall not be installed.

Wires and cables shall be arranged in a neat and orderly manner in wire gutters and equipment enclosures. Minimum bending radius of low voltage single and multiple conductor power and control cables shall be not less than eight diameters.

Conductor Installation

Install all conductors in a single raceway at one time, insuring that conductors do not cross one another while being pulled into raceway. Leave sufficient cable at all fittings or boxes and prevent conductor kinks. Keep all conductors within the allowable tension and within the minimum bending radius.

Lubricate for wire pulling, if used, shall conform to code requirements for the insulation and raceway materials.

Splicing

No splicing of joints shall be permitted in either feeders or branch circuits, except at outlets, and accessible junction boxes. Use compression type solderless connectors when making splices or taps in conductors No. 8 Awg or larger. Utilize preinsulated connectors equal to 3M Company "Scotch-lock", or Ideal Industries, Inc. "Super-Nut", for splices and taps in conductors No. 10 Awg and smaller. All other twist-on connectors must be approved by Engineer.

Conductor Termination

Provide all power and control conductors, that terminate on equipment terminals or terminal strips, with solderless lugs or

fork and flanged tongue terminals. This type of conductor termination is not required when the equipment is provided with solderless connectors.

Conductor Identification

Where conductors from more than one conduit pass through a common pull-box, the group of wires from each conduit shall be bound together and each group shall be permanently marked with an approved label, with the circuit designation.

ELECTRICAL SUPPORT DEVICES

General

All necessary supports required for the safe and proper installation of electrical equipment shall be provided. Supports shall be constructed of materials and in a manner that will match the features of the structure or area. All support materials shall be galvanized or cadmium plated.

All hardware, screws, nuts, bolts, clamps, etc., shall be of rust and corrosion-resistant materials such as stainless steel bronze, galvanized malleable iron or shall be galvanized or cadmium plated prior to the application of the factory or field paint finish.

Equipment supports, steel sections, etc., which are to be secured to structure steel, shall be clamped with beam-clamps.

Where concrete, tile, brick or other masonry is found unsuitable for supporting required loads by means of expansive type screw anchors, or where directed by the Engineer, holes shall be drilled entirely through the wall or slab and through-bolts with plates or washers installed as supports. Where necessary, bolt heads and plates shall be countersunk flush with the masonry.

No drilling of structure steel members shall be permitted without written approval of the Engineer. Overstressing of steel members shall be avoided.

All surface mounted electrical equipment enclosures shall be installed on vertical channel sections secured to structure steel, concrete or masonry with appropriate means mentioned heretofore.

UNDERGROUND ELECTRICAL

General

This includes all trenching, backfilling, removal and restoration of surface areas, mandreling, capping and the testing of the conduit run ready for installation of wires.

Trenching

Establish centerline of trench by establishing dimensions and ties and record on drawings. Departure from alignment may be made, subject to approval, in event intangible or unforeseen obstacles are found. Trenching may be excavated by mechanical trenching equipment, except in immediate vicinity of existing underground utilities, where hand excavation shall apply. Maintain trench walls essentially vertical to minimize shoulder surface disturbed. Ascertain type of soil to be excavated before bidding. All excavation is considered unclassified.

Open complete length of trench so that if any obstructions are encountered, proper provisions can be made to avoid them. For single conduit lines without concrete encasement, construct trench not less than 6 inches nor more than 12 inches wide. For two or more conduit lines installed at the same level and without concrete encasement, construct trench proportionately wider. Construct trench bottom to conform accurately to grade to provide uniform support for conduit along its entire length, and place in the bottom of trench a 4 inch thick layer of bedding material consisting of soft dirt, sand, or fine fill containing no particles that would retain on a 1/4-inch sieve, and tamp until firm.

Grades

Grade trench to provide 3-inch fall per 100 lineal feet.

Conduit

Install conduit of size, material, type and at approximate locations shown on Drawings. Avoid pockets or traps where moisture may accumulate. Securely fasten conduit in place during construction and cap ends to prevent seepage of water or dirt during progress of work, with removable caps. Clean each conduit run with mandrel or equivalent means.

Install conduits for direct burial so that top of conduits are at least 30 inches below finished grade. When two or more conduits are installed in the same trench, install conduits not less than 2 inches apart (measured from outside wall to outside wall) in a horizontal direction and not less than 6 inches apart in a vertical direction.

Backfilling

After conduit is secured, backfill trench in 6 inch layers with excavated material not larger than 4 inches in diameter and

thoroughly tamp and compact to at least the density of surrounding undisturbed soil. Moisten or aerate backfill material as required for desired compaction. Remove excess water from trench during backfill operations. Completely backfill trench and tamp level with adjacent surface. Remove and dispose of any excess excavated material as directed by the Engineer.

GROUNDING

General

Install a grounding system to all items of this project which require grounding according to the rules and regulations of the National Electrical Code, and connect to existing plant grounding system.

All panelboards, transformers, control panels, motors, motor starters, conduit and other related items of electrical equipment included in this project shall be grounded.

Where ground conductors are to be bonded to structure steel, or ground wire to ground wire, or ground wire to ground rod, the connection shall be a thermit weld similar to Burndy Engineering Company's "Thermoweld", or Erico Products Inc., "Cadweld Kit".

All ground wire, bus, etc., in locations where subject to mechanical damage, shall be protected by rigid steel conduit, steel guards, or other suitable shield. In all cases where conduit or other metallic encasement of ground conductors is required, the conductor shall be permanently and effectively bonded to the enclosure at both ends of its length.

Where ground wires are attached to equipment, conduits, cabinets, etc., approved solderless lugs, compression connections or clamps shall be used. Silicon bronze machine bolts, nuts and lockwashers are required for all bolted connections above finished grade elevation.

System Ground

The location and extension of the existing ground system is unknown, but it can be assumed that a ground bus exists at all existing distribution panels serving this installation.

The number, spacing and location of ground rods to be driven is unknown. All connections to ground rods shall be below ground or floor level in which they are located. The new

grounding system shall have a resistance of less than 5 ohms to ground. The resistance of each individual ground rod added to the system shall be recorded with copies of the records sent to the Engineer.

Equipment Grounding

All metal enclosures, motor frames, motor starters, panels, switches, etc., which are not rigidly secured to and in contact with the grounded structural metal frame of the building or conduit system, or which are subject to excessive vibration and loosening of ground contacts, shall be securely bonded to building steel, or to conduit system by means of stranded copper conductors.

Where flexible metallic conduit used at motor connections is the only ground connection, an additional stranded conductor shall be installed inside the flexible conduit as a ground connection. It shall be connected to a locking type grounding bushing at each end of the conduit, at the motor and at the motor starter providing a path for ground currents which would otherwise flow through the flexible conduit.

PANELBOARDS

General

All panelboards shall be installed complete with pull boxes, mounting bolts, supporting steel, anchors, conduits and wiring, all sized in accordance with these Specifications and/or as indicated on the Drawings.

Panelboards mounted on concrete, brick, etc., shall be secured by expansive screw anchors.

Branch circuit loads shall be balanced between phases. Circuit numbers shall be identified on circuit directory furnished with panelboard.

LUMINARIES

General

Lighting fixture luminaires shall be installed, complete with lamps. Drawings show only approximate location and spacing of luminaires. Final positioning is to be determined by piping

and other obstacles encountered in the field. Home runs are to be by best possible route determined in the field. The luminaire units shall be wired, with flexible cord, to receptacles, for ease of removal and maintenance.

MOTORS AND MOTOR CONTROLS

Motor Starters

All motor starters with individual enclosures shall be mounted with spacers (Unistrut, Kindorf, etc.) to walls or building frames near motors.

Safety Switches

All safety switches shall be installed where indicated on Drawings, complete with mounting bolts, supporting steel, anchors, conduits and wiring, all in accordance with these Specifications.

Remote Control

Install all remote control (pushbuttons, selector switches, etc.) on or near motors where indicated on Drawings.

SECTION 16.4 - ACCEPTANCE TESTS

GENERAL

This section of the Specifications provides for all material, equipment, labor and technical supervision to perform and complete the Electrical Acceptance Tests as required and hereinafter specified for Contractor and Owner furnished electrical equipment.

All circuits shall be tested in the presence of the Engineer, and shall test free of grounds, short circuits and other defects under standard test requirements of the N.E.C. and local Inspection Bureau. The insulation resistance tests of secondary power feeders, lighting circuits and control circuits shall be made by the Contractor.

Expense of such test shall be borne by this Contractor, who shall furnish all instruments required.

The equipment and materials upon which acceptance tests are to be performed are as follows:

A. Power Cables - 600 Volts and Lower

B. Control Devices

C. Control Wiring

D. Transformers, Special

E. Rotating Equipment

F. Grounding

Acceptance tests as herein specified are defined as those tests and inspections required to determine that the equipment involved may be energized.

Final acceptance will depend upon equipment performance characteristics as determined by the subject tests, in addition to complete operational tests on all electrical equipment to show that the equipment will perform the functions for which it was designed.

These Specifications intend that the workmanship methods, inspections and materials used in erection and installation of the subject equipment shall conform with accepted engineering

practices, applicable Standards, the National Electrical Code and more specifically:

A. These Specifications

B. Manufacturer's Instructions

RESPONSIBILITY

The Contractor shall be responsible for all tests and test records. Testing shall be performed by and under the immediate supervision of the Contractor, except as specifically noted, and shall be made only by a qualified and competent test technician, fully experienced on this type of test.

All testing shall be done in the presence of the Owner and/or Engineer.

Records of all tests and inspections, with complete data of all readings taken, shall be made and incorporated into a report for each piece of equipment tested. A copy of all test reports shall be delivered to the Owner and Engineer at the end of each test period.

The Contractor shall provide all necessary test equipment and shall be responsible for setting-up all test equipment, wire checks of factory wiring and any other preliminary work in preparation for the Electrical Acceptance Tests.

All tests shall be scheduled by the Contractor and cleared by the Engineer. No testing shall be done without this clearance.

The Contractor shall be responsible for a visual inspection of the equipment, which shall be made immediately prior to the testing and/or energization of the equipment.

The Contractor shall notify vendors of equipment and invite the vendor to witness the test on equipment being tested under this Specification.

Manufacturer's Representives stationed on the job, shall be advised of all tests on their equipment. Reasonable cooperation shall be extended, to permit witnessing by a representative of the manufacturer of the material under test, should the manufacturer so request.

Final acceptance of the Contractor completed work shall be contingent upon the satisfactory performance and results of the required tests and trials.

All electrical workmanship found to be defective, shall be corrected by the Contractor at no additional cost to the Owner. The replacement of any equipment or materials found to be defective, shall be the responsibility of the Contractor.

TESTING

The insulation tests (megger tests) as hereinafter specified, list the minimum readings acceptable, when taken at an ambient temperature of 60°F (15.56°C) and at low relative humidity. When megger readings fall below the specified minimum values, it shall be the duty of the Contractor to provide corrective measures for the purposes of drying-out the equipment. The method devised by the Contractor, must be approved by the Engineer. If drying is to be done by applying an electrical potential to a piece of equipment, then in no case shall the applied voltage or resulting current, induced or indirect, exceed the continuous rating of the equipment being subjected to drying action.

All 1000 Volt and 500 Volt motor driven megger tests shall be held for one (1) minute or until the reading reaches a constant value for fifteen (15) seconds, unless specified otherwise hereinafter.

All megger readings shall be recorded as well as ambient temperatures at time of test.

Phase matching and phase rotation shall be finally checked immediately prior to energization of equipment covered by these Specifications.

RECORDS

All test data and results shall be recorded.

All test reports shall be prepared by the Contractor, signed by the Authorized witnesses and approved by the Engineer.

Six (6) copies of the approved test reports shall be furnished to the Owner and two (2) copies to the Engineer.

POWER CABLE - 600 VOLTS AND BELOW

All new or reconnected power cable feeders and branch circuits shall be tested for continuity and shall be free of grounds and

short-circuits and shall be given a megger test using 1000 Volts motor driven megger.

Lighting circuits and other 120 Volt services shall be identified and shall pass operational tests to see that the circuits perform all functions for which they are intended.

All wire and cable connections must pass a visual inspection for workmanship and conformance with standard practice.

Continuity shall be checked by means of a d-c device using a bell or buzzer.

All power wiring shall be tested for proper operation and correct switching control of apparatus involved.

The 600 Volt circuits shall be tested with motor control center and power panel switches disconnected and with connections at the other end as follows:

A. Conductors to special transformer(s) shall be connected to the transformer(s) for testing as per Specifications.

B. Conductors to motor starters or power panels shall be disconnected from the starter or power panel for the initial test and followed by conductors connected to the open starter or switch.

Megger tests shall be made between one conductor and ground, with the other conductors grounded. Each conductor shall be tested in the same manner. The minimum acceptable megger reading for disconnected cables shall be 160 megohms/1000 cable feet.

Any conductor having a megger reading markedly lower than average, even though meeting minimum requirements, shall await further instructions from the Engineer.

The power conductor which contains shorted or grounded conductors, as indicated by tests, will not be accepted.

The power conductors shall satisfactorily pass all tests listed above.

ACCESSORIES

Complete and accurate records of all tests shall be made.

Prior to energization of equipment, all compartments and equipment components shall receive a visual inspection by the Contractor in the presence of the Engineer.

All breakers, switches, contactors and motor starters shall be given complete operational tests, to determine that all design functions are satisfactorily performed.

All control devices shall be operated through all design functions. This shall include all remote control operations as well as local operations of all motor starters and actuation of all alarm and indication devices according to design Specifications.

All control circuits, automatic operations and interlocks must be tested, by electrical energization, for correct and positive operations.

All combination motor starters shall be checked for correct fuse rating and for overload element coordination with the motor current requirement of the installed motors. Circuit identification, motor horsepower, full load current, fuse rating and overload element rating shall be tabulated and submitted with the test report.

CONTROL WIRING

All control wiring shall be tested for continuity and shall be identified. Continuity shall be tested by means of a d-c test device using a bell or buzzer to "ring" out the wires. Phones may be used for communication between testers, but not in place of specified test device.

Each control conductor shall be given an insulation resistance test with a 1000 Volt megger. The test shall be applied between each conductor and ground, with all other conductors in the circuit or raceway grounded. The minimum megger reading shall be 80 megohms.

SPECIAL TRANSFORMERS

All 480 Volt and lower primary, dry type transformers shall be given a megger test after connection with their primary conductors are completed. The supply shall be meggered with the primary windings connected to the open switch or breaker as the case may